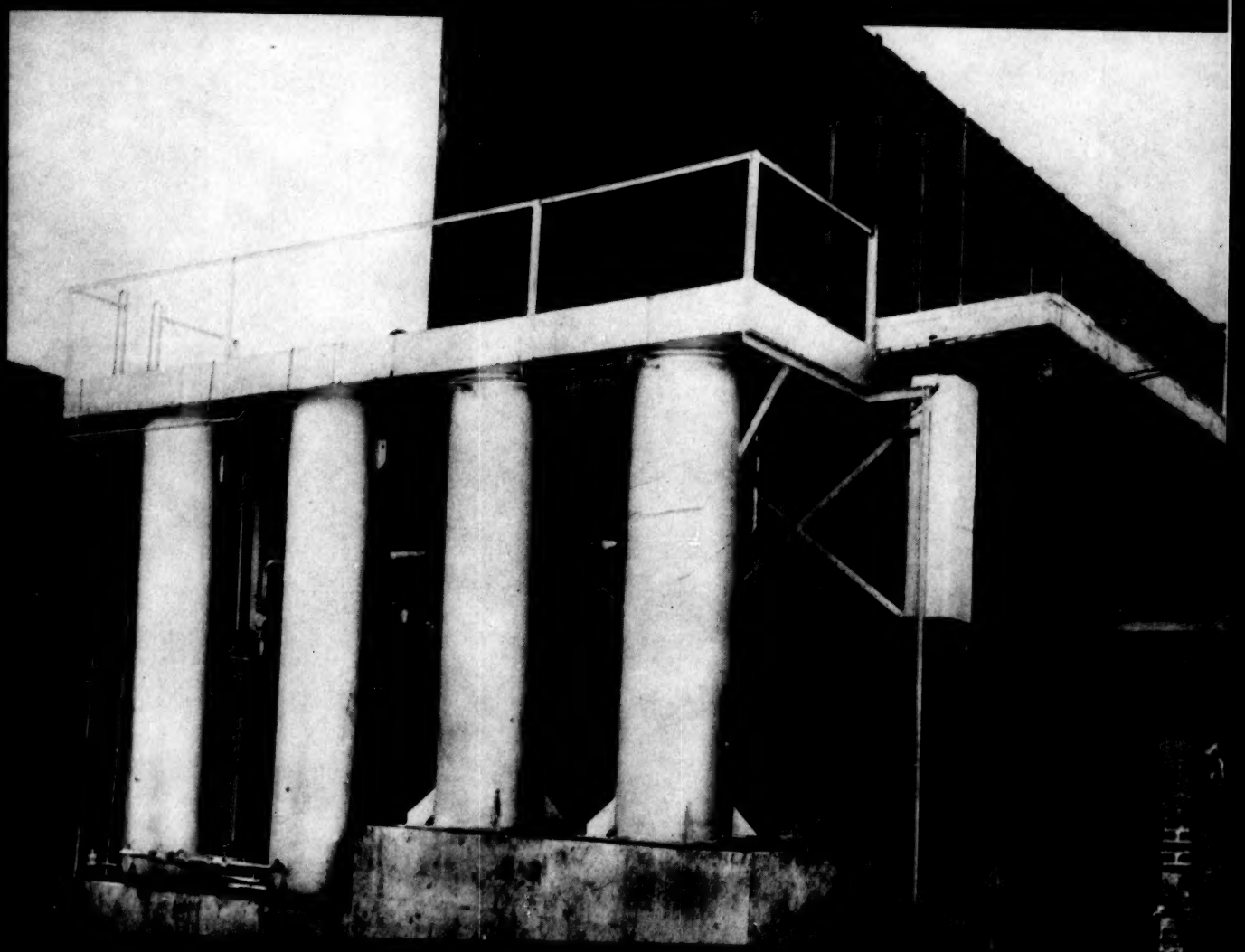
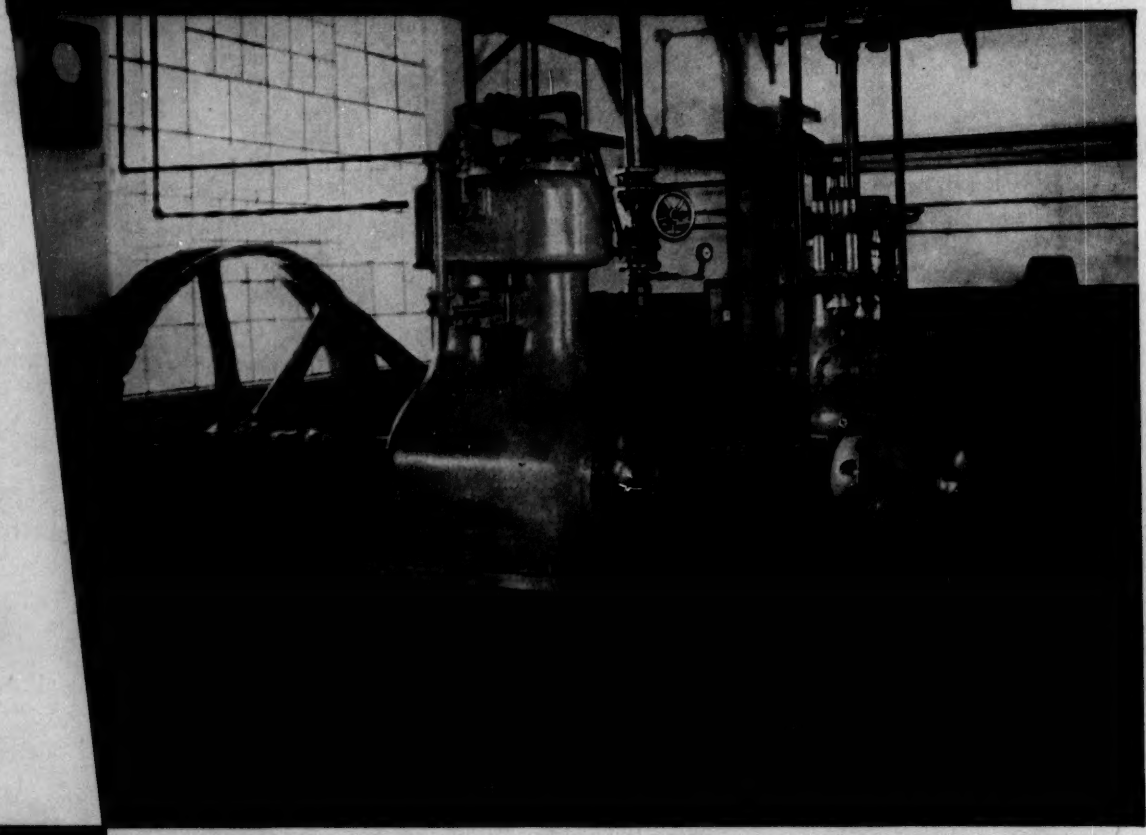
INDUSTRIAL REFRIGERATION



How to assure *dependable* refrigeration



PROFITABLE, efficient refrigeration depends on effective compressor lubrication. With *Texaco Capella Oil (Waxfree)* in your compressors, systems stay exceptionally clean for smooth, dependable performance. Even at temperatures as low as minus 100 degrees F., *Texaco Capella Oil (Waxfree)* will not precipitate wax in systems.

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For expert advice in selecting the proper lubricants for your compressors, contact a Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write:

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The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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FOR ALL REFRIGERATING AND AIR CONDITIONING COMPRESSORS

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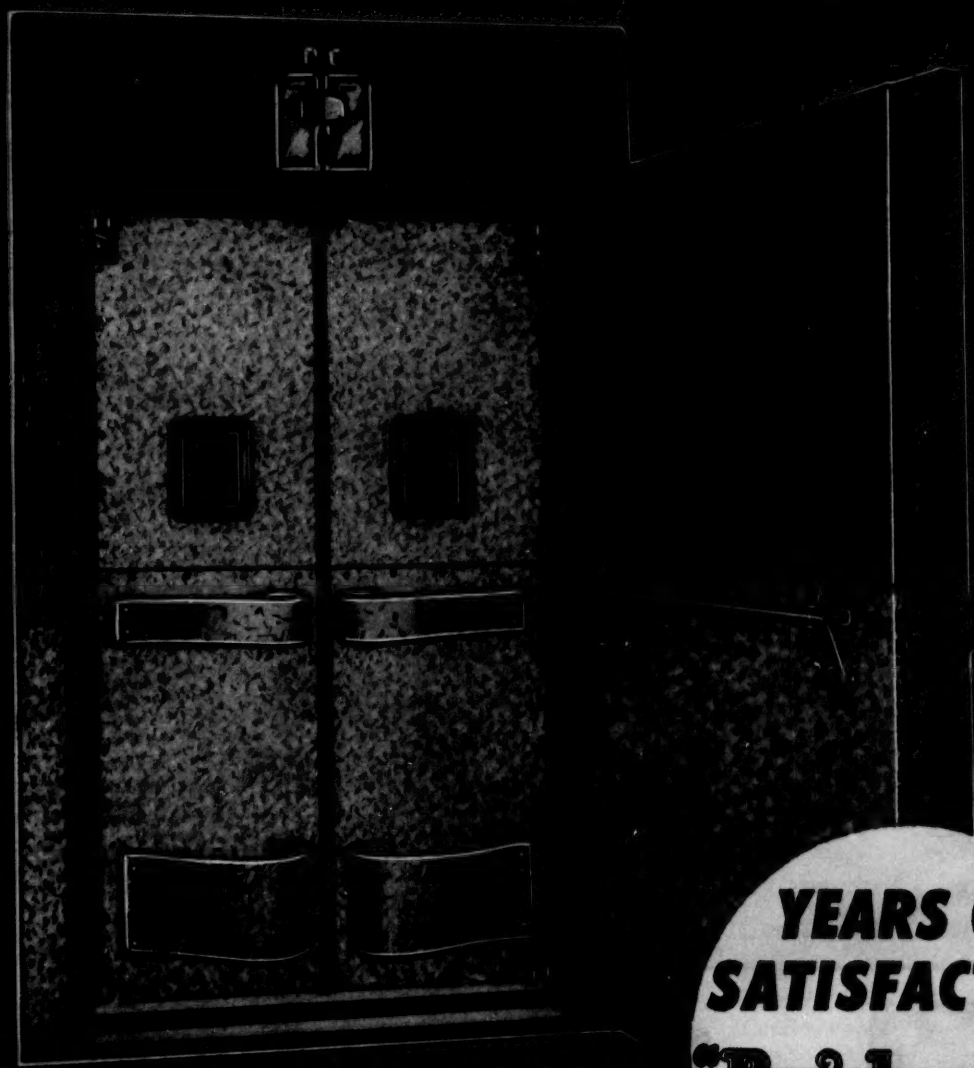

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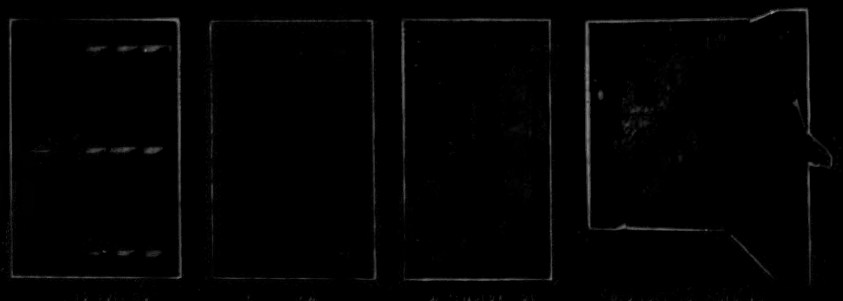
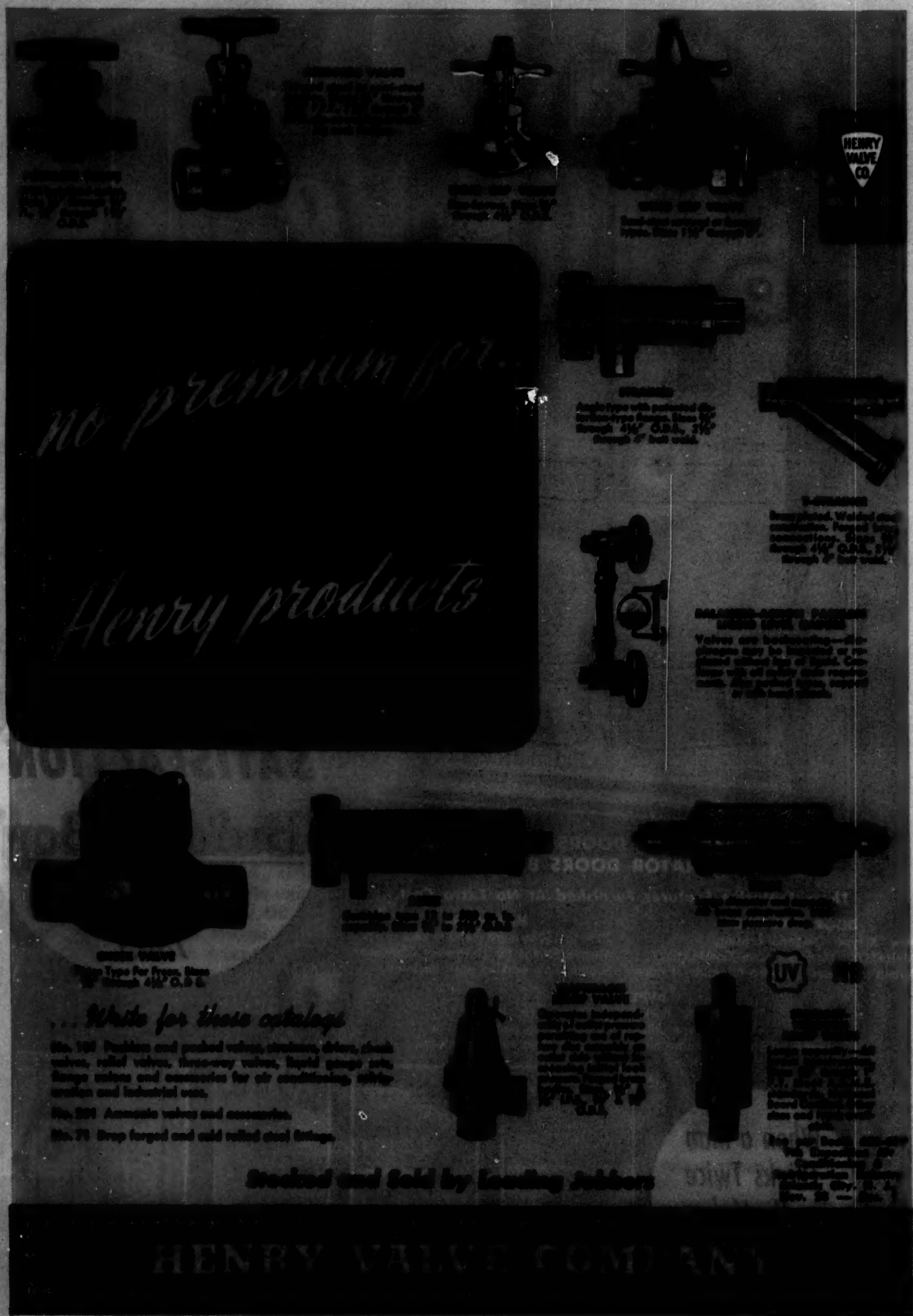


BUTCHER BOY REFRIGERATOR DOOR CO.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LETTERS

(Letters to the editor are welcome from readers of INDUSTRIAL REFRIGERATION on any subject of general interest.)

Student Appreciates Training in U.S.

Bangkok, Thailand

It is already one year since I left all my friends in the States. Now I am very busy. Time seems to go so very fast when we work against it.

I try to make use of all the knowledge I got from the many different phases of training in the States, especially refrigeration. Our big cold storage, 1000-tons capacity, is under way to completion in a few months time. All the Vilter compressors and boosters from Milwaukee, are already installed, the fin coils set, and the ice tank built.

I built myself a walk-in cold storage having two rooms of 300 cut. ft. each, using "Freon-12" as refrigerant. One works at 10 F and the other at 35 F. this cold storage will serve as a laboratory where I am trying to find out the best temperatures and humidities for food storage of those commodities native to Thailand.

I follow NAPRE activities from INDUSTRIAL REFRIGERATION. I saw the group picture of Mr. Bert McKenna, vice-president, and his wife in connection with the Mid-West Regional Conference held last Spring. This reminds me of the many times I have had occasion to join the NAPRE chapter sessions and the 44th Convention at Purdue University. Please extend my best wishes and thanks to the many members and friends who so kindly assisted me.

PONGSE DIBAVADI
C. Ratana Clinic, Bangkok

Editor's Note: Mr. Dibavadi, a graduate chemical and agricultural engineer, came to the United States in 1953 as the representative of his government, under the International Cooperational Administration program of our government. He studied food preservation methods here, and took his refrigeration training at California State Poly, under the direction of Dean Harold P. Hayes, who conducts the Question Box in this publication. He also managed to take in some very helpful meetings with NAPRE, NARW, and other association events. It is a gratifying experience to print his expression of appreciation.

Industrial Refrigeration

formerly ICE AND REFRIGERATION
Now in its 64th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 129 November, 1955 Number 5

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The Cover

When tubing installations in these condensers at the Macon Georgia Ice Plant of Atlantic Ice and Coal Company, Atlanta, Georgia, failed within two and three year periods of operation, the firm investigated service records of suitable corrosion resistant materials. Following an analysis of the chemical content of both raw and condenser water used in the condenser application, Atlantic's chief engineer R. A. Schoonover specified corrosion resistant wrought iron tubing as the economical choice to replace the failed tubing. More than 5500 feet of 10 gauge wrought iron tubing, 2-inch O. D. is now serving in the condenser units.

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What's New

MACHINERY
APPLIANCES • PROCESSES

Temperature Recorder with Quick Range Changing

AN improved high sensitivity bimetal actuated miniature recorder for use on trucks, railway cars, cold storage rooms, refrigerator cabinets, etc., which permits easy, rapid range changing, and which will operate accurately in any position, has been introduced by the Weston Electrical Instrument Corporation, Newark, N.J.

Minature Temperature Recorder

Known as Model 8465, this recorder is an entirely self-contained instrument, unaffected by atmospheric pressures and sturdily constructed to resist the severe service encountered in modern transportation. The pen, which operates directly off the sensing element without the usual multiplying levers, gives accurate records regardless of the position of the instrument. The case is made of light weight but sturdy die-cast aluminum to provide maximum crush resistance, and has no protruding parts. It is furnished for a wide range of operating temperatures, from minus 40 to 140 F., in 50 and 100 F included spans.

The outstanding feature is the ease and speed with which range changes can be made simply by inserting the new chart, and, using a standard thermometer as reference, adjusting the range changing screw with ordinary screwdriver.

Sporlan Catch-Alls For Ammonia Systems

ONE of the more serious problems on ammonia systems is the removal of pipe scale, core sand, and other abrasives that cause excessive wear on compressor parts and controls. Pitting, or wire drawing of pins and seats in float valves, solenoid valves, and thermostatic expansion valves, is one of the serious consequences resulting from the failure to remove foreign matter from the ammonia system. In many instances, these particles are so minute that it is extremely difficult for an ordinary strainer, using 60, 80, or even 100 mesh screen, to successfully remove them.

Sporlan Catch-Alls, with ⅛, ¾, and 1 inch FPT connections are now used as scale traps on ammonia systems. These filter-driers are the replaceable core type and range in size from the 1 core, 48 cu. in. model to the large 4 core, 192 cu. in. model. (The cu. in. represent the effective volume of desiccant.)

The molded, porous cores of the Catch-All are capable of filtering out the small particles of scale and foreign matter that may cause serious damage to the system.

Air Compressor Has New Design

A NEW, small and compact, but high capacity, air compressor was introduced recently by Bell & Gossett Co., Morton Grove, Ill. Of revolutionary design, it was explained, this new compressor produces oil-free air from a twin piston design. A new concept in cylinder wall lubrication is used.

The versatility of the new B&G compressor is evidenced by its adaptibility to the plumbing, heating and refrigeration industries. Its portability and low cost, yet high capacity, makes it an ideal candidate for every contractors truck. (1) It is ideal for paint spraying a completed piping job, (2) to pressure test new piping systems for leaks, and (3) it is readily adaptable to many pneumatic tools, caulking hammers, star drills, etc. It is also easily converted to operate as a vacuum pump.

In industry too, the oil-less compressor should have many uses, including pumping liquids, spraying, sand blasting, operating grease guns, pneumatic temperature control systems and pneumatic tools; agitating, elevating and transferring acids, chemicals and other solutions and operating dry sprinkler systems, air brake switches and signal systems. The new oil-less compressor including the electric motor is completely engineered and built by Bell & Gossett, manufacturer of equipment for circulated water heating and cooling systems, water heaters and centrifugal pumps. The new compressors are rated for continuous operation at 35, 75, and 175 pounds and horsepower ranges from ¼ to ¾.

Bell & Gossett Air Compressor

Caterpillar Announces New Diesel Engine

A COMPLETELY new 5¾ inch bore x 8 in stroke, 6 cylinder diesel engine has been announced by Caterpillar Tractor Co. Adding to the company's line of modern, heavy-duty diesel engines, the all new Cat D342 is rated at 190 horsepower for intermittent duty, and replaces the company's D13000 Engine.

The more compact, modern design of the D342 presents a clean, easily maintained unit composed of many parts already standard in all of the company's 5¾ inch bore engines. Valves, valve springs, valve rotators, valve seat inserts and piston assemblies on the new unit fit a wide variety of Caterpillar Engines. Other features include a new, larger capacity water pump; relocation of lines and tubes which have been placed inside the block for better appearance; and inexpensive, capsule-type fuel injection valves.

Three starting systems are available as attachments. These are: air, direct electric and gasoline. Electric starting for the gasoline starting engine is also available. The D342 is equipped with the simplified fuel injection system featured on all Caterpillar Diesel Engines. Each injection valve is a small capsule that allows easy, inexpensive replacement. Its large, single orifice combined with a precombustion chamber affords foul-free operation on inexpensive non-premium fuels.

Tests of Fire Ban

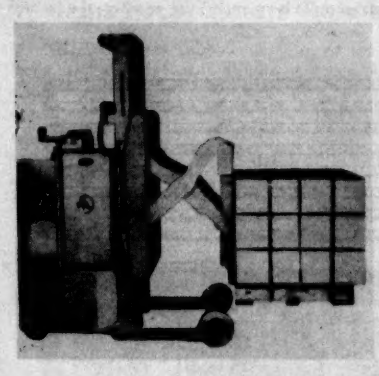
TEST reports on "Fire-Ban", the new fire-rated finish for industrial insulations, are now available, it was announced in September by E. H. O'Neill Co., Chicago, the manufacturers. Purpose of the tests was to determine the effect, if any, of temperature cycling on the material.

The panels tested by Inland Testing Laboratories, and reported on individually by insulation materials to which applied, showed no signs of cracking or failure of the surface coat. Starting at ambient, test panels were subjected to more than minus 60 F and plus 160 F temperature, intermittantly. Surface was a 3/16 — inch trowel coat of Fire-Ban. Insulations used in the tests were "Styrofoam", "Rock Cork", "Fiberglas", "Foamglas", and Corkboard.

Advantages claimed by the manufacturer are the light weight, thinner-coat applications which need no scoring, as compared to conventional cement finishes. The material carries a rating by the NBFU, making possible savings of insurance penalties or omission of elaborate sprinkler systems possible in certain applications. It may be brushed, sprayed or troweled on pipe covering, insulated ducts, exposed insulation surfaces, and timber or masonry structures.

Electric Tiering Truck

A NEW riding type electric tiering truck called the "Reach Master" equipped with hydraulically extendable forks, has been announced by Lewis-Shepard Products, Watertown, Mass. The ReachMaster does not straddle the load to be picked up; the truck is simply positioned before the load and the forks are extended into the pallet. The pallet and load are then raised up over the wheels and retracted into the truck.



New Lewis-Shepard Electric Tiering Truck

To place a load in a storage rack, the truck and load are positioned before the empty space in the rack and the load is extended into the rack and dropped. The forks are then retracted from the pallet.

The new truck is equipped with large 10 inch diameter rubber tired load wheels to give the best possible floor protection. It can be used with pallets of varying widths and can cut existing aisles in warehouses, which have been laid out for larger counterbalanced fork trucks, to six feet, with no changes required in pallets or storage racks.

The truck has a capacity of 2000 lbs and can handle loads up to 48 inches long. The hydraulically actuated stroke of the forks is 24 inches with standard lift heights available to 118 inches. It has three speeds forward and reverse with a top speed of 4.1 mph. Reversing the speed controller automatically applies the dynamic brake.

Direct Current Drives Show Comeback

THE industrial trend toward greater mechanization and more automatic means of production is sharpening demand for direct-current drives, according to P. D. Ross, manager of marketing for General Electric's Direct Current Motor & Generator Department, Erie, Pa. Mr. Ross said this is a reversal of an earlier trend away from direct-current drives.

In the early days of the electrification of industry, he noted, all electrical power was provided by direct current machines. However, he pointed out, with the development of a-c systems, lower cost of induction motors and greater efficiency of a-c distribution, direct-current motors were supplanted in many applications by a-c drives.

Mr. Ross said the d-c comeback is reflected in increased demand throughout industry for adjustable speed drives. Pointing up the strides made by the industry in recent years, he cited U.S. Department of Commerce figures which he said show purchases of direct current motors in the one to 200 horsepower range are up 85 per cent since the end of World War 2. This compares with a 20 per cent increase in the same period in purchases of all motors within that power range.

"If industry is to meet increasing demands for goods and services while keeping production costs at a minimum," Mr. Ross declared, "further mechanization and more continuous processing will be necessary. The demand for direct-current equipment is keeping step with present continuous processing trends and will continue the upward climb."

Commenting on the merits of d-c drives for automatic processing, he explained that the adjustable speed provided through use of d-c equipment makes it possible to vary operating speeds at various stages of production as needed. "There is no device yet discovered," he said, "that is a better, more universal source of precisely controlled adjustable speed." Although few utilities supply d-c power, he said, conversion is easy with packaged equipment, motor-generator sets and rectifiers.

Eliminates Sticking in Pumps

THE cause of sticking in seasonally operated pumps such as used on cooling towers, evaporative condensers, and air conditioning water recirculating equipment, is relieved by Pump-Aid, manufactured by Garman Co. Inc. St. Louis, Mo. When seasonally operated pumps are drained for shut-down periods, corrosion continues to occur within the pump housing which is usually made from iron or ferrous metals. This causes sticking of close tolerance surfaces when pump is called upon to operate at beginning of following season, even though the impeller itself may be non-corrosive bronze or brass. Such difficulty results in costly repairs to both pump and motor.

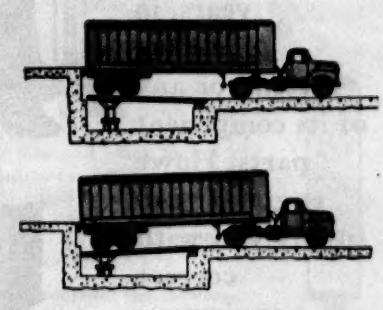
To protect against corrosion and other "down" period problems, Pump-Aid is injected under pressure through the drain hole into the pump housing cavity immediately after draining pump. Pump-Aid is supplied in aerosol canister using fluorinated hydrocarbon ("Freon") type propellant, so as to instantly permit a generous (patent pending) coating over all surfaces. It also is claimed to be beneficial in preserving neoprene, rubber, and graphite type seals.

Pump-Aid Application

Other claims are: It will not freeze; will not evaporate; requires no special job preparation to use; adheres to surfaces permanently until flushed off; is water soluble — not necessary to drain when season starts; throw switch, begin operation; non-toxic; may be used for seasonally operated domestic pumps if properly flushed; and economical to use.

Truck Leveler Device For Loading and Unloading

A DEVICE which will save dock space, help attain fastest loading and unloading of highway carriers is now being manufactured by Rotary Lift Co., Memphis,, Tenn. Called the Rotary Truck Leveler, it is designed to raise or lower the entire rear section of any truck or trailer to bring the bed on a level with the loading dock.



The Rotary Truck Leveler For Loading and unloading trucks

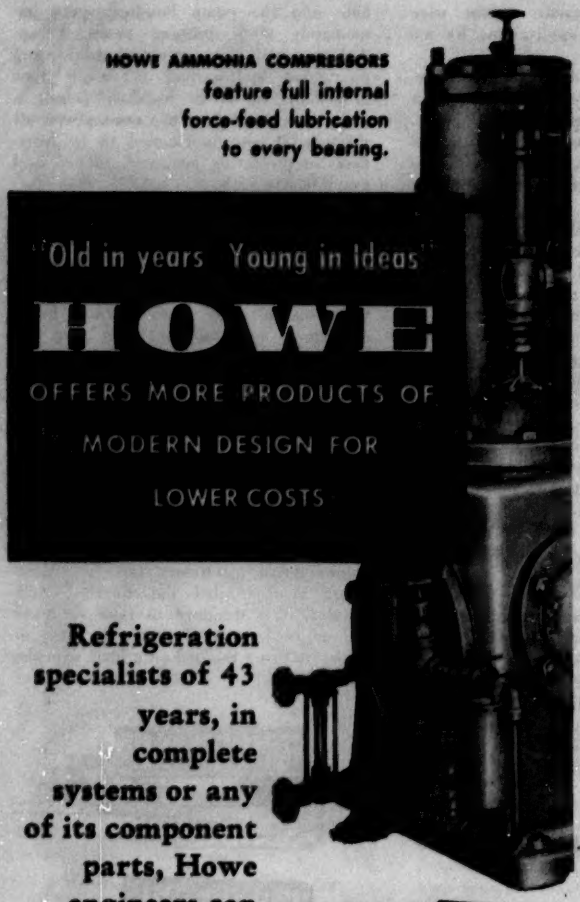
Thus leveled, pallet or fork trucks can move from dock to trailer bed without using ramps or dockboards. The angle of incline between dock and bed is reduced to a minimum, eliminating the problem of low-underclearance pallet trucks "hanging up" on sharply inclining ramps. There are no dock obstructions to restrict traffic flow. The Rotary Truck Leveler is a 10 ft x 14 ft non-skid steel platform set into the driveway area in front of the loading dock.

It is distinguished by a raised center curb section which acurately guides trailer wheels onto the runways. Trailer spotting is simplified and trailers parked at night for unloading the next morning are always correctly positioned since wheels cannot overhang edges of the leveler platform to prevent lowering of the leveler.

In use, the truck or trailer backs onto the leveler. Push-button controls actuate an electric power unit which raises or lowers the leveler until the trailer bed is level with the loading dock.

Operation is by a compact Rotary Oildraulic electric power unit which may be located wherever convenient.

HOWE AMMONIA COMPRESSORS
feature full internal
force-feed lubrication
to every bearing.



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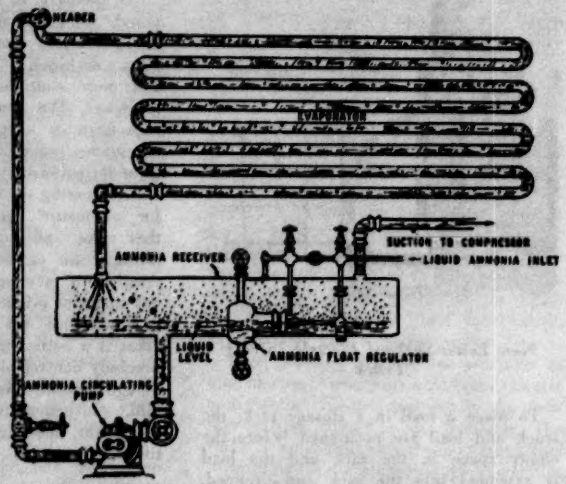
York Recirculating Systems With Low Head Pumps

AMONG the pioneer refrigerant liquid controls is York's application of low head pump to the liquid recirculating system. According to York, the modified recirculation system is used primarily with ammonia, although the principle is applied successfully on individual evaporator applications using refrigerants of the "Freon" series.

Essentially, this system can be visualized by comparing it to a brine recirculating system, in which the cold brine is pumped from the brine cooler through piping in the room to be cooled, and back again to the brine cooler. With the liquid recirculation system, cold liquid refrigerant is pumped in exactly the same way.



Typical York Liquid Ammonia Recirculating System.

The high side arrangement is typical of the conventional refrigeration system, since the recirculating system does not affect high side design. From the high pressure receiver, liquid is fed into the low pressure receiver, the flow being controlled by a low pressure float which maintains a set liquid level at a rather low elevation in the low pressure shell. The pump circulates this liquid refrigerant through the evaporator, the refrigerant being discharged into the distribution main at 10 to 20 pounds above the evaporator pressure.

New High Speed Masonry Drill

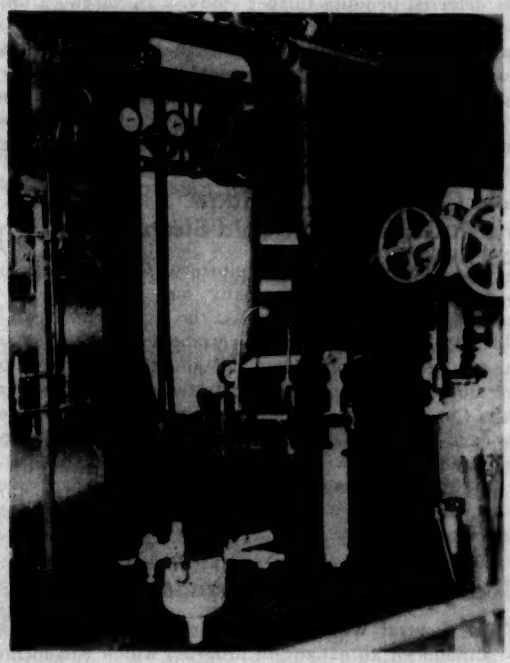
THE addition of a new self-sharpening diamond bit masonry hand drill is annuonced by Molco Drilling Machines Inc., Washington, D.C. This product will be known as the Model A-1

Model A-1 Hanmole high speed hand masonry drilling machine, featuring a self-contained electric drill with integral water injection system.

Hanmole, a light-weight, high speed (3200 rpm) hand drill equipped with a special integral water injection system which forces water down the center of the drill bit to act as a cooling agent. Simple, quick-change adapters allow bit size difference of from ¼ to 2 inches O.D. The drill operates on standard 110 volt power. Unlike a water swivel attachment to an electric drill, the Hanmole features one complete compact unit designed especially for the hand operation of cutting holes in glazed tile, glazed brick, concrete, granite, marble and other hard building materials. Any standard faucet is adequate for the water supply. A light-weight pressure tank capable of supplying water for 30 minutes of drilling is available for outside jobs.

Watkins Recirculators Gain In Popularity

LIQUID recirculators manufactured by the J. E. Watkins Company, Maywood, Illinois, are designed to force all evaporators to maximum efficiency with positive full-flooding. An evaporator coil in the usual plant, suggests R. B. Bass, sales manager of the company, is likely to operate with only part of its surface wetted. The plant engineer pinches down on hand or automatic expansion valves, or adds separation space in surge drums, to prevent slugs of liquid from "boiling out" of the coil and damaging the compressors.



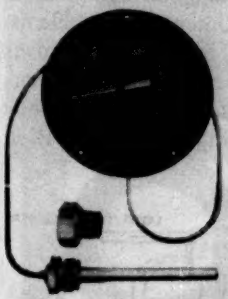
A typical installation of liquid refrigerant recirculator manufactured by the J. E. Watkins Company. White surface of accumulator drum is insulation finish.

Slugging (full-flooding) of evaporators is designed into the Watkins recirculating system. Top efficiencies are assured in evaporator operation because the coil is fully wetted and the oil is washed out. Any excessive slugging into the recirculator automatically stops the liquid feed from the plant receiver, until the slugs are recirculated to and vaporized in the evaporators.

Installed quickly into the suction line ahead of the compressors, the Watkins recirculator protects them from slugs. According to Bass, it feeds gas to compressors at negligible superheat. It is the only patented system for catching excess liquid in the suction line and recirculating it to the evaporators, using no mechanical pumps. The described operating economies are the reasons for the increasing number of recirculator installations taking place in the industrial refrigeration field. These recirculator systems are operating in refrigeration plants from coast to coast and many have been installed in foreign countries.

Need thermometers? ...ASK TAYLOR

IF you do you can't do better than call your Taylor Field Engineer. He is a specialist in temperature measurement. And Taylor makes a wide variety of thermometers for just about every possible application in the refrigeration industry. If you prefer, write for **Catalog 300.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.



THERMOGUIDE* Dial Thermometer
An extremely reliable and sturdy vapor-actuated instrument for Brine Lines, Brine Tanks, Ammonia Lines, Cold Storage Rooms, Refrigerators, etc. Variety of standard ranges from minus 40° to + 120°F. Four forms of bulb and connection. Case diameter 6½".
No. 14KV123, $38

Metal Wall Thermometer
Easily read, even in dimly lighted areas. Non-fading red liquid in magnifying tube and black figures and graduations on white background. Flanged edges give tube maximum protection. Range minus 40° to + 70°F., in 1° divisions. Length 12".
No. 1106, $2.75

Taylor Industrial Thermometer
Exclusive BINOC* tubing, makes it three times easier to read. For Cold Water, Brine, Ammonia, Condenser, Hot Water and Steam Lines, Brine Tanks, Cold Storage Rooms, etc. Many bulb and stem styles and angles. Ranges minus 40° to 950°F. or equivalent Centigrade. Illustrated,
No. 1185385, $29.50

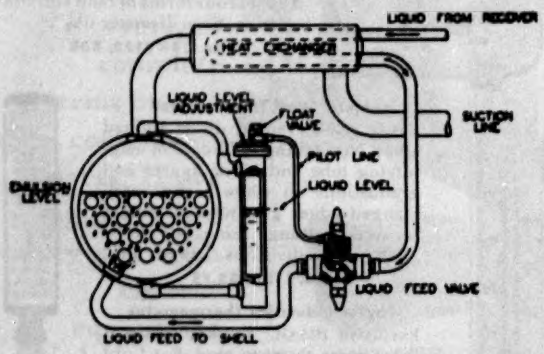
*Reg. U.S. Pat. Off.

Bi-Metallic Dial Thermometer
Gives high degree of accuracy at low cost. All-metal stainless steel construction. 3" or 5" diameter case. Stems 4", 6", 9", and 12". Separable wells, ¾" and 1"; 2" extension neck for 6" and 12" stems. Ranges from minus 40° to +750°F. Ranges up to 400°F. damped against vibration. $16 to $26, depending on dial size and stem length.

Taylor Instruments
MEAN ACCURACY FIRST

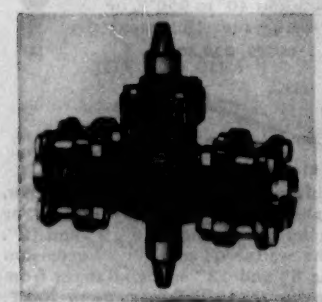
MODULATING-TYPE PHILLIPS VALVES INCREASE REFRIGERATION EFFICIENCY

A line of refrigerant valves that permit higher heat transfer rates and more stable operation of refrigeration systems has been developed by H. A. Phillips & Co., Chicago. The valves are the modulating type which automatically and continuously adjust the refrigerant flow to the refrigeration load. According to Phillips engineers, modulated refrigerant feed keeps evaporator tubes constantly wetted, insuring maximum heat transfer at all times. "Hunting" of system pressures and temperatures, a common occurrence with "off-on" refrigerant control, is also eliminated. Loading on compressors is more even, reducing maintenance problems. Phillips modulating controls include float valves for high and low side installation and both thermostatic and float pilot operated feed valves. They are applicable to a wide range of refrigeration systems.



LOW SIDE CONTROL

A typical low side method of Freon level control using Phillips Valves. Arrangement balances weight of liquid in float chamber with liquid and gas in evaporator. Float Valve at left controls high capacity Pilot Operated Feed Valve.



Phillips Float Valve for use with Pilot Operated Feed Valve. "Level Eye" on float chamber shows liquid level, simplies adjustments. An adjusting stem allows changing control level as much as 2 inches.

Phillips Refrigerant Feed Valves for both low and high side use are available from ⅛ to 5-in. pipe size for all refrigerants.

Write for full details and typical hook-up drawings.

PHILLIPS

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REFRIGERATION CONTROL SYSTEMS

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PRESS BRIEFS

Air Conditioning Controls In Omaha

REGULATION of the use of water for air conditioning is being considered by directors of the Omaha, Neb., Metropolitan Utilities District. This was disclosed at a meeting at which the board appropriated $1,528,000 for planning and construction of additional water supply facilities. General Manager Ralph H. Trester told the board that air conditioning was responsible for water consumption in Omaha reaching levels which had not been expected until the 1960s. He said air conditioning installations without towers to conserve water accounted for 20,000,000 to 30,000,000 gallons a day during peak periods.

The district's directors served notice that control of this use of water is coming. They discussed a high fee for these units in addition to the water cost. While action was deferred pending further study, a fee of $40 a ton a year was considered. While there was some sentiment to ban use of air conditioners without towers, indications were that the high fee plan would be given preference. Those owing units without towers would be given time to convert them. The directors publicly advised that persons considering conditioners should contemplate towers.

New Company to Manage British Government Cold Storages

THE MINISTRY of Agriculture of Great Britain has announced that a company has been formed to undertake, on an agency basis, the management of 47 cold storages built by the government during the war. The storages, with a capacity of about 15 million cubic feet and widely dispersed for strategic reasons, will remain the property of the government. They are now managed by designated cold storage concerns, and similar arrangements will apply under the new company. In addition to being maintained for use in an emergency, the storages will be used for government storage, and commercially.

Albany Warehouse Expands

THE Central Warehouse Corporation, Albany, N. Y., announced an expansion program which will include construction of an $800,000 one-story reinforced concrete warehouse for frozen foods. The site, a six-acre tract, was purchased and construction of the building is expected to be started in the near future, it was announced by John L. O'Brien, president. Central Warehouse Corporation will augment its present facilities by approximately 720,000 cubic feet of space for storage and distribution of frozen foods, plus 100,000 cubic feet for other facilities, Mr. O'Brien said.

U.S. Cold Storage Buys Poultry Plant

THE stockholders of the United States Cold Storage Corporation have voted to increase the number of common shares from 120,000 to 200,000. The company plans to acquire the assets of Edward Aaron Corporation, Kansas City, Mo., a poultry and egg processor and distributor, in exchange for 16,000 shares. The rest of the newly authorized common will be retained for possible further expansion, officials said.

New Dairy Plant Will Speed Service

A NEW plant is under construction at Stone Avenue and North 127th Street, Seattle, Wash., to accommodate the rapidly expanding business of Medosweet Dairies. The building, a compact, one-story structure, was designed by Daniel Lamont and Lester Fey, architects and engineers. It will be of steel-reinforced concrete and will provide swift transfer of milk and other dairy products from transport to delivery trucks.

Many new features are included in the design. An endless-chain conveyor, countersunk in the floor, will be frigerated transports to delivery vehicles. The conveyor capable of moving 480 quarts of milk a minute from refrigerated transports to delivery vehicles. The conveyor is reversible to provide for rapid unloading of the empty bottles. Facilities will be provided for the simultaneous loading of 22 delivery trucks. The entire deck of the building will be covered with diamond-plate steel for maximum sanitation and ease of movement. Cawdrey & Vemo, general contracting firm, is constructing the building which was expected to be completed by November 1.

Martin Traub, president of Medosweet, said the present expansion is one of a number of progressive steps being taken by his company to pace the growth of the Northwest. The company, a Northwest-owned and operated concern, has been in operation for more than 50 years.

AWA Announces Special Train And Post-Convention Trip

GENERAL President Irving S. Culver of the American Warehousemen's Association has appointed Malcom A. McConnell, Jr., Packers Terminal & Warehouse Corp., Chicago, as Chairman of a Special Train Committee that is setting up one of the highlights of the forthcoming 65th Annual Meeting to be held at Los Angeles April 10-13. Details will be available later but it can be announced now that an all streamlined, modern AWA Special will be leaving Chicago for Los Angeles on Wednesday, April 4, 1956. The accommodations, meals, equipment, and other arrangements will be of the finest, and the itinerary will include a full day's stop-off at the Grand Canyon.

An interesting post-convention tour to Hawaii is being arranged to follow the convention. The trip complete, including round-trip transportation from Los Angeles, meals, and hotel on the Island, will be something less than $500. It will be an "all-air-trip," allowing considerably more time in the restful, scenic and "out of this world" environment of the most famous group of islands in the world.

Air Conditioning for Louisiana State

A $720,000 air conditioning program on the Louisiana State University campus has been approved by the Louisiana State Building Authority. LSU Comptroller Daniel Borth told the authority that the project, calling for building a central unit with a view to eventual air conditioning of the entire campus and immediate air conditioning of several buildings, was "justified on the basis of present space that will be made useable."

Pointing out that many university research projects required air conditioning, he said that "small units are very costly." Rep. Bryan Lehmann, chairman of the appropriations committee of the Louisiana House of Representatives, said he thought the action was justified and that eventually all schools would be air conditioned.

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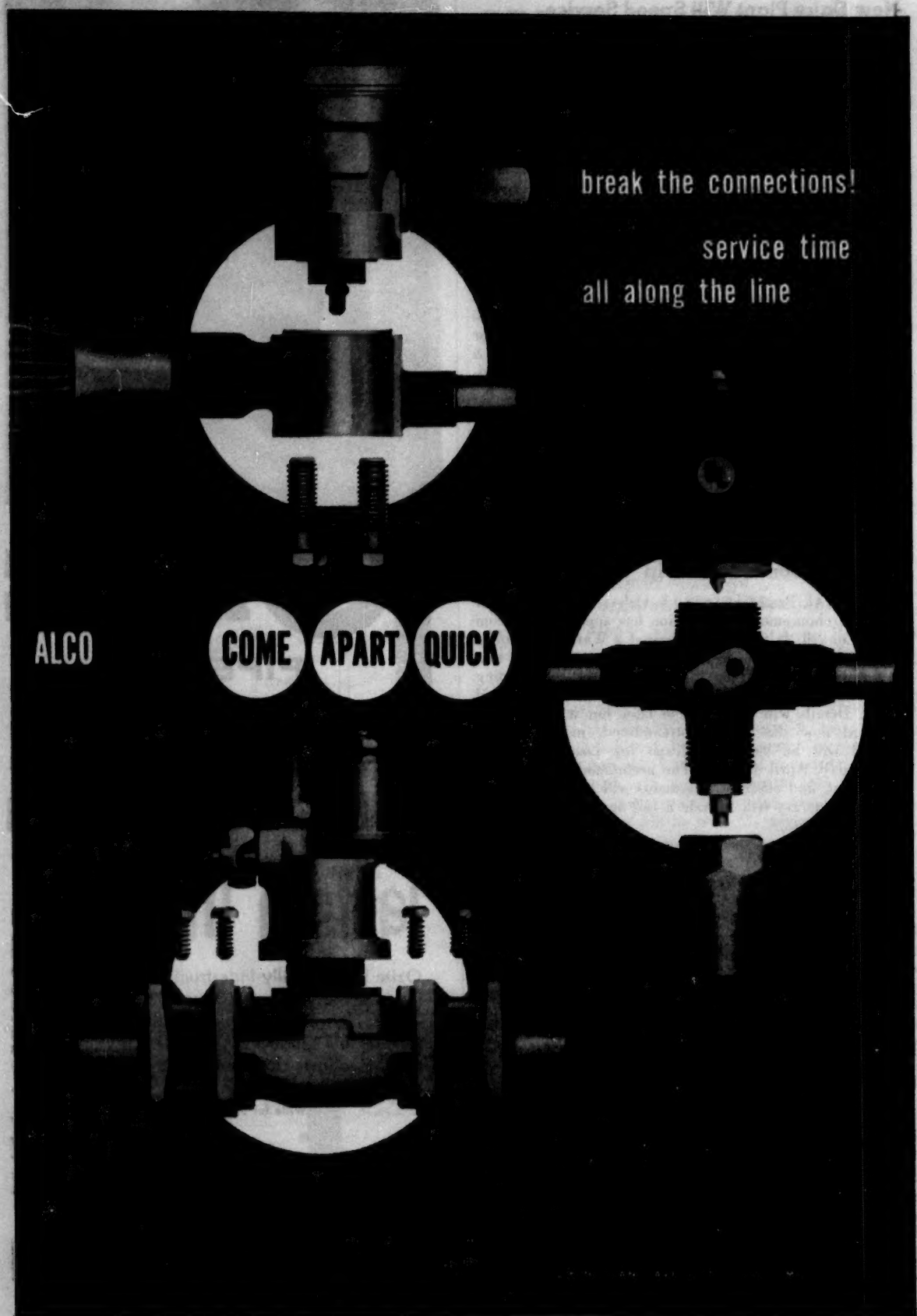
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In the Spotlight

EFFICIENT refrigerating in today's business economy may often mean the difference between making the profit planned, or seriously undershooting the mark. Many solutions are offered. Personnel training, efficiency contests, incentive devices, and other human relations ideas have helped in many instances. Replacement of obsolescent equipment and antiquated systems has also kept the refrigeration plant owner competitive in his field. However, many owners are overlooking a comparatively inexpensive refinement to their systems. In this issue, W. F. Stoecker, Refrigeration Instructor, University of Illinois, explains the use and economic advantages of liquid recirculation systems, starting on page 13.

THE NINTH International Congress of Refrigeration was held at Paris August 31 - September 15, almost fifty years after the Congress was organized and the first meeting was held in that city in 1908. Some 1500 refrigeration experts representing 52 countries including the United States were there to present papers on various phases of industrial refrigeration. A wide range of technical refrigeration subjects covered by nine special commissions. Report of this meeting with summaries of important papers starts on page 20.

PRACTICAL demonstrations are helpful to the refrigerating engineer when they help him picture events or happenings within a system. On page 33 is a verbatim account of a demonstration by an analytical chemist before one of the NAPRE chapters. Acid formation in a refrigeration system is described, and its removal demonstrated.

A NEW application of prestress to cantilever beams supporting short drop-in beams was used in construction of a new warehouse in Fort Worth, Texas for the United States Cold Storage Corporation. Illustrated description of the new plant was published in the October issue. This system has proved to be economical in steel construction and it effects similar economies in prestressed concrete construction. Description of the new process, with diagrams, is included in the article starting on page 27.

A PREVIEW of the program of the fifty-first annual meeting of the American Society of Refrigerating Engineers to be held at the Traymore Hotel, Atlantic City, N. J. is given on page 32. A record attendance is expected. In addition to three technical sessions, there will be nine sessions planned to cover special subjects; and a full entertainment program.

INCREASED cabinet space and enlarged back-room storage are two important improvements needed by the grocery trade to take care of frozen food sales and servicing. This was the suggestion presented by F. D. Newell, Jr., President of National Association of Refrigerated Warehousemen at a recent meeting of leading grocers. Mr. Newell's talk is summarized in article on page 52.

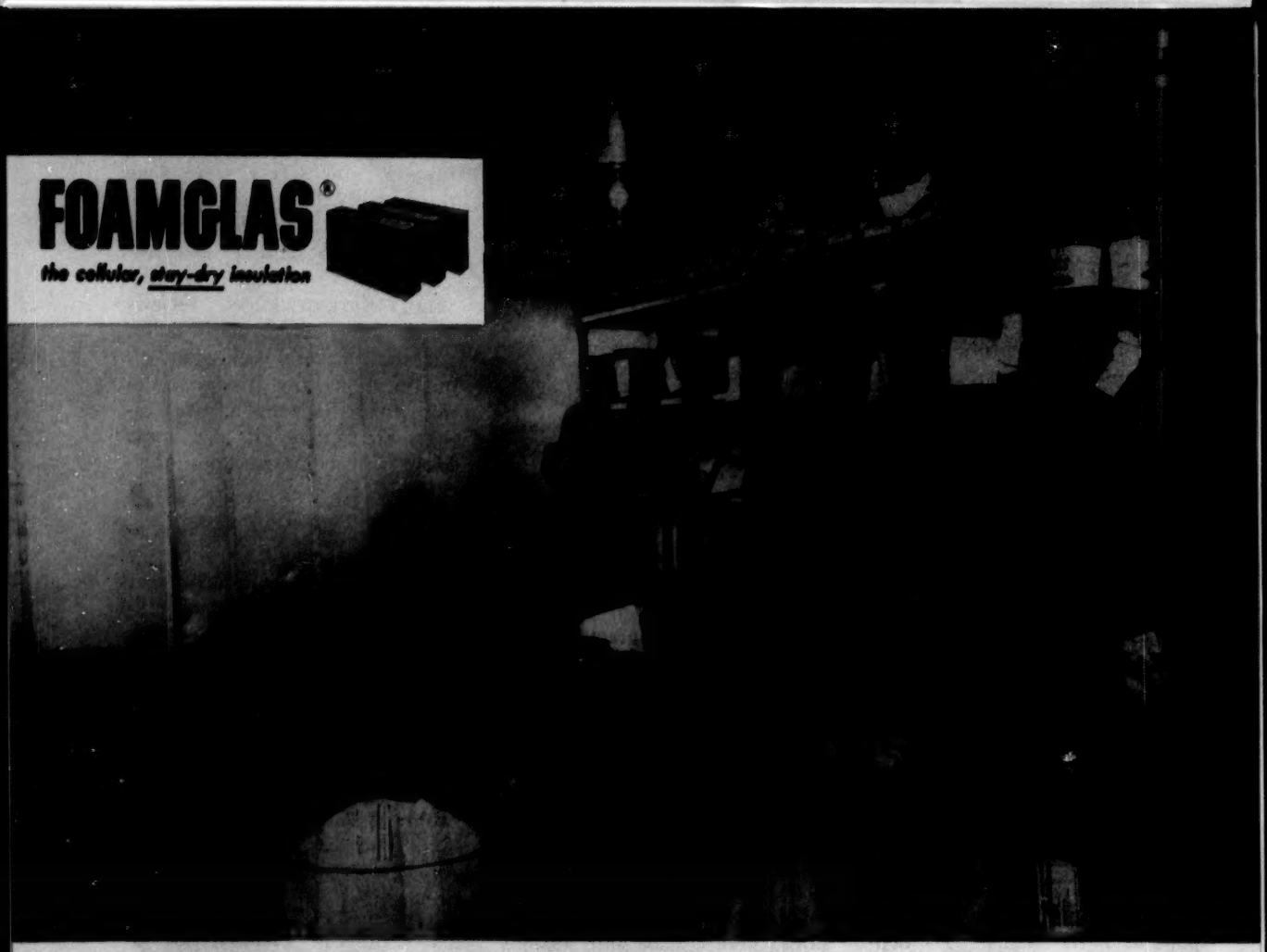
THE ANNUAL convention of The Florida Ice Association was held at Daytona Beach October 10 and 11. An important part of the program was a report of the Safety Committee and presentation of safety awards to four ice companies. See page 46.

AUTOMATIC PLANTS, transportation industry refrigeration, public building air-conditioning, and safety were one-third of NAPRE's principal topics at the Association's 46th annual meeting held at Los Angeles. Starting on page 36, INDUSTRIAL REFRIGERATION reviews briefly the coverage of the talks, and the speaker's background or qualifications for his presentation. Only half the lecture features are covered in this issue. More will be reviewed in December.

THE NATIONAL ice convention this year will have for its theme "High Gear For Next Year", and the program will adhere closely to that idea. In addition to the usual program of discussions, presentations and reports, there will be three headline speakers, an exhibit of ice making equipment and supplies, and a high class entertainment program. The convention will be held at the Biltmore Hotel, Los Angeles, November 15-18. For preview use page 43.

RAPID-ICE FREEZING, a process developed in Zurich, Switzerland has found particular favor in some European and Middle East Countries because of its economical cost of production. In the United States it is expected to appeal chiefly to smaller industrial rather than commercial ice manufacturers. Previously described in INDUSTRIAL REFRIGERATION, the article on page 47 gives late information on this interesting process.

TODAY'S HIGH Speed, super-strength and close tolerance production techniques have brought more and more low temperature refrigeration uses into U.S. industries. This issue in an article by I. R. Kramer, page 50, contains another article on the application of expandable refrigerant to mercury freezing for investment casting processes by this method.



"FOAMGLAS stays dry for constant, dependable insulating protection in our 14 coolers and freezers"

states John J. Bryner, Chief Engineer, New Orleans' Roosevelt Hotel

New Orleans' Roosevelt Hotel protects $80,000 worth of stored food with *stay-dry* FOAMGLAS . . . used to insulate 14 new freezers and coolers plus piping. Their recent expansion and modernization program, increasing diner capacity to over 3200, called for greatly increased cold storage space. Another insulation in their older refrigerated rooms had absorbed moisture and failed—so they switched to FOAMGLAS for the new construction.

John J. Bryner, the Roosevelt's Chief Engineer and past president of the National Association of Practical Refrigerating Engineers, says:

"Moisture in an insulation means trouble. It cuts efficiency, destroys insulating value. We use FOAMGLAS because its sealed glass cells can't absorb moisture. It gives us constant protection without expensive maintenance.

"Removing the moisture problem also helps prevent refrigerating odors in our stored food. Rodents are no problem since the insulation is vermin-proof."

Mr. Bryner concludes: "We've had perfect service from the FOAMGLAS we installed in freezers, coolers and on piping last November. We anticipate many years of maintenance-free insulating protection with it."

Take a tip from John Bryner and the Roosevelt Hotel. Let cellular, *stay-dry* FOAMGLAS give *you* perfect protection for your insulated spaces, piping and equipment. Write for a free sample and our literature containing complete details on this remarkable insulation.

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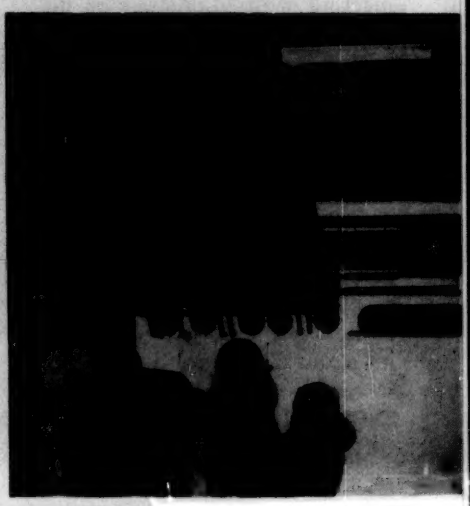
The Roosevelt's 14 coolers and freezers vary in temperature from −10°F. to +43°F. FOAMGLAS was applied in thicknesses of 4", 5", 6" and 8" depending on temperature requirements; finish is sheet aluminum. All exposed piping in the cold storage system is insulated with FOAMGLAS. Insulation Contractor: Eagle Asbestos & Packing Co., Inc., New Orleans



Liquid Ammonia Recirculation

W. F. STOECKER
Mechanical Engineering Dept.
University of Illinois

Some confusion exists among refrigeration users over popular references to "liquid recirculation" and "liquid return." This article, as well as being informative with regard to economic application of liquid recirculation in industrial refrigeration plants of modern times, should help clarify the use of each method or system. Both promote efficiency and improve plant safety features. Here is "Liquid Recirculation". In December, INDUSTRIAL REFRIGERATION, read about "Liquid Return".

This article describes two methods of recirculating liquid to the evaporators. One method is to use a mechanical pump to recirculate the excess liquid back to the evaporator. Design data in that section of the article are taken from systems supplied by York Corporation. The other method of recirculating liquid described here is the type used by the J. E. Watkins Company. A system operating by this method collects the excess liquid from the evaporator for a short period of time, then applies high pressure ammonia gas to the accumulated liquid to recirculate it back through the evaporator.

PERHAPS some refrigeration plant operators would raise an eyebrow at anyone who would intentially flood heavy slugs of liquid out of his evaporator. Yet it is done in the liquid recirculation system; and by using special equipment, liquid recirculation promotes better efficiency of the plant.

What Is Recirculation?

Liquid recirculation consists of feeding liquid to the evaporator at a greater rate than it is evaporating, and returning the excess liquid to the evaporator. The suction gas which flows with the excess liquid out of the evaporator separates from the liquid and travels back to the compressor. In this article, recirculation refers only to systems which continuously flood liquid from the evaporator and return the liquid directly to the evaporator. Liquid-return systems, which intermittently return trapped liquid from an accumulator to the high side primarily for compressor protection will be discussed in a later article.

Why Recirculate?

The principal reason for using liquid recirculation is to improve the performance of the evaporator. All of the available evaporator area is utilized, heat transfer on the inside of the evaporator tubes is improved, temperatures of the evaporator are kept uniform and oil is continuously washed off the inside of the evaporator.

The compressor shares in the benefits of liquid recirculation. Since the system is designed to completely separate liquid from the suction gas, the compressor is protected from liquid carryover. Also, the suction gas enters the compressor with no appreciable superheat, so discharge temperatures are kept low.

Complete Flooding

A liquid recirculation system uses all of the heat transfer surfaces of the evaporator by completely wetting the inside of the tubes with liquid ammonia. A portion of the evaporator in a conventional system is ineffective if superheating occurs.

Referring to Fig. 1, which shows a sketch of a conventional flooded evaporator fed by a float valve, the level of the liquid in the tubes is lower than the level in the float chamber. The level of the liquid in the float chamber must be higher than the level in the evaporator to overcome friction in pushing the ammonia through the tubes.

At low refrigeration loads, the level in the evaporator tubes may be at point A and the evaporator is completely flooded. Should a heavy load come on the evaporator, however, the ammonia boils away faster, liquid feeds into the evaporator at a higher rate and the pressure drop through the tubes increases. The liquid level in the tubes drops to point B to compensate for the greater pressure drop. Above point B, the evaporator fills with superheated gas which does little cooling due to its higher temperature.

The drop in liquid level at high loads could be lessened by selecting large-sized tubes. However, larger tubes boost the cost of the evaporator. Another way to insure flooding is by raising the level of the float chamber. The elevated float chamber, however, increases the liquid head and consequently the pressure of the liquid at the bottom of the evaporator. This causes the liquid near the bottom of the evaporator to boil at a temperature higher than necessary and some evaporator capacity is lost as a result.

In liquid recirculation no superheating can occur since positive circulation forces the liquid through the evaporator. All surfaces in the evaporator are washed with liquid by delivering much more liquid than would be needed for evaporation.

Oil-Free Evaporators

Oil-logging of the evaporator is always a problem in ammonia systems. Oil which collects in the evaporator not only displaces ammonia and thus reduces the effective evaporator area, but an oil film on the

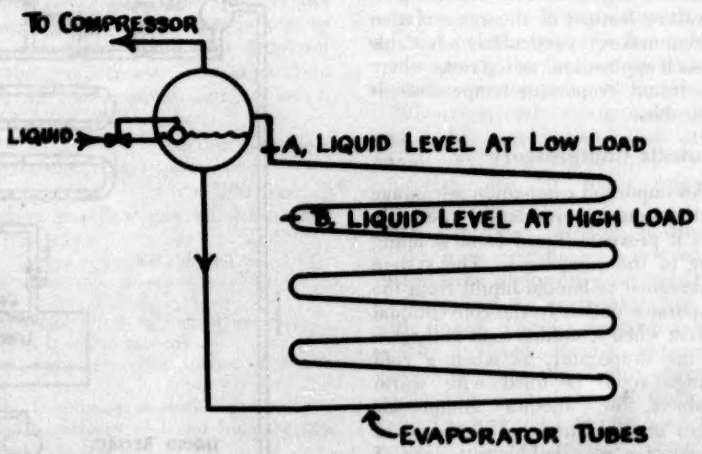


Fig. 1. — Conventional flooded evaporator showing levels of liquid in the evaporator at high and low refrigeration loads.

inside of the evaporator tubes reduces the rate of heat transfer. The moving liquid in a recirculation system can wash the oil out of the evaporator tubes to a point where the oil can be easily drained.

Better Heat Transfer

High heat transfer coefficients on the inside of the tubes are provided by the increased velocities and wetted surfaces in liquid recirculation. Actually, this feature is of little benefit in evaporators which cool air by natural convection. In natural convection coils, the resistance to heat transfer on the air side is so large that improved heat transfer on the refrigerant side causes no appreciable overall effect. With blast coils, however, where the air side heat transfer resistance is low, an increase in the refrigerant coefficient could be noticeable. Even if the increased velocity of the refrigerant in the evaporator is of no benefit, the heat transfer is definitely improved by freeing the evaporator of oil.

Uniform Temperatures

With liquid recirculation, the temperatures at all points in the evaporator are practically uniform. In an indirect system using brine, for example, the temperature of the brine changes continuously throughout the evaporator. Even in a conventional flooded system, any superheating near the outlet of the evaporator raises the temperature of that region of the evaporator.

In a recirculation system, since there is liquid present at all points, the only variation in temperature is due to the pressure drop in the evaporator which changes the boiling temperature of the ammonia. This variation in temperature is usually less than one degree F. The constant temperature feature of the recirculation system makes it particularly adaptable to such applications as ice rinks where a constant evaporator temperature is desirable.

Protects Compressors

An important companion advantage of the liquid recirculation system is that it prevents liquid from slopping over to the compressor. The system is designed to handle liquid from the evaporator outlet. In the conventional system when a sudden load is thrown on the evaporator, as when a cold storage room is filled with warm products, or another compressor comes on the line, the high rate of evaporation may bubble out slugs of liquid. In the liquid recirculation system, liquid carry-over from the evaporator is normal and a little more liquid due to foaming goes unnoticed.

Hot-gas defrost systems sometimes present the hazard of damaging the compressor. During the hot-gas defrost, liquid fills the evaporator and when the system reverts to cooling operation, some liquid may carry over to the compressors. The liquid recirculation system, however, handles the liquid from the evaporator in its customary way and the compressor is in no danger.

Where Can It Be Used?

Recirculation may be used on any size of plant, although the extra expense is probably not justified in plants smaller than about 10 tons. One recirculation system can serve a number of evaporators. It can be used with liquid chillers, although recirculation is more beneficial to serpentine-tube evaporators. In liquid chillers where the ammonia evaporates in the shell of the chiller, the ammonia passages generally have sufficient area so that foaming does not carry liquid out of the evaporator. Also, since there is little pressure drop in the liquid chiller evaporator, the liquid level does not drop appreciably during high loads. On the other hand, recirculation may improve the performance of liquid chillers by wetting all of the tubes.

The advantages of recirculation are most prominent in such evaporators as gravity air cooling coils, blast coils and other tube-type evaporators.

Part I — Recirculation by Mechanical Pump

Basic flow diagram of the recirculating system which employs the mechanical pump is shown in Fig. 2. The liquid recirculating pump takes liquid from the low pressure receiver, builds up the pressure and forces it up to a header which feeds the evaporators. From the header, the liquid flows down through the evaporators. At the top of the evaporator, the ammonia is completely liquid but as it flows down through the evaporator some of the ammonia evaporates, forming bubbles of gas.

The quantity of liquid which the pump delivers is always more than is subsequently evaporated. At the outlet of the evaporator, the ammonia is a mixture of liquid and gas. In the low-pressure receiver, gas separates from the liquid and passes into the suction line to the compressor. The liquid which comes out of the evaporator drops to the bottom of the low-pressure receiver to be sent back to the evaporator. A float valve maintains the level of the liquid in the low pressure receiver by feeding liquid from the high side of the plant.

Down-Feed

Feeding liquid to the top of the evaporator can be done in the recirculation system and has certain advantages over bottom-feeding. In the first place, the liquid in the lower portion of a bottom-feed evaporator is under a static head. The liquid in the lower portion of the evaporator, therefore, requires a higher temperature to boil. In a minus 20 F evaporator, for example, each foot of head raises the boiling point approximately one-half degree F. At minus 40 F, each foot of head raises the boiling point one degree. With down-feeding, however, the liquid drains through

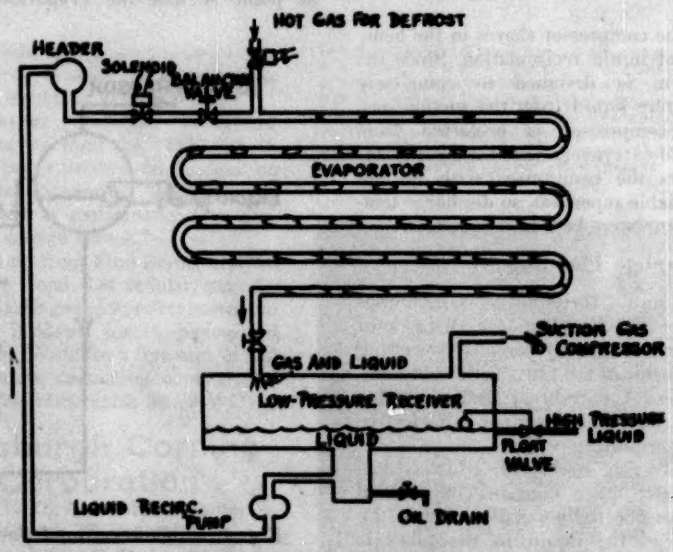


Fig. 2 — Liquid recirculation system which uses a mechanical pump.

the evaporator at virtually the same pressure throughout.

Any oil which carries over into the evaporator eventually collects in the bottom of the low pressure receiver. The accumulated oil can be drained easily, by opening the drain valve at the bottom of the low pressure receiver.

In the bottom-fed system, enough ammonia must be available to completely fill all of the evaporator volume for a low-load condition. When the feed is downward, however, only about 25% of the evaporator volume is occupied by liquid over the entire load range. In a 20 ton evaporator with 10,000 ft of 1¼-inch coil, for example, the internal volume would be about 85 cu ft. The ammonia charge may be reduced 2500 lbs and the size of the low-pressure and high-pressure receivers may be correspondingly reduced.

Design

To give the reader an idea of the sizes and capacities of the major elements in the mechanical pump recirculation system, procedures for sizing these elements will be explained. Design data presented here are by courtesy of York Corporation.

Liquid Pump

Gear pumps have proven to be adaptable and reliable for recirculating liquid ammonia. The pressure differential against which the pump works is normally from 10 to 30 psi. The pressure drop in the evaporator is small—usually limited to one pound per square inch—but there is a pressure drop in the balancing valve. For protection of the pump and its motor, a pressure relief valve should be installed. This relief valve by-passes the liquid discharging from the pump back to the intake should flow become obstructed. The setting of the pressure relief valve should be about 15 pounds higher than the full-flow pressure differential of the pump.

The capacity required of the pump, of course, depends upon the size of the evaporators. The pump circulates 2½ to 4 times the quantity which evaporates. If, for example, the evaporator is to provide 50 tons of refrigeration at a temperature of 10 F, the pounds of ammonia evaporated per minute would be:

$$\frac{50 \text{ tons} \times 200 \text{ Btu/min/ton}}{561 \text{ Btu/lb}^*}, \text{ or}$$

17.8 lb/min, or 3.25 gal/min.

If the pump is to circulate, say, three times the quantity evaporated, it would pump 9.75 gpm. The motor size to drive this pump would be ½ hp.

*Latent heat of NH_3 at 10 F.

Pumping volatile liquids is always difficult because of the tendency of liquids at their boiling temperature to flash into vapor. To prevent flashing, the pump should be located directly beneath the low pressure receiver with a liquid leg on the suction of the pump of at least several feet.

Low-Pressure Receiver

The low-pressure receiver has two functions. It must provide enough space so that it could store all of the ammonia in the evaporators, and it must separate the suction gas from the liquid.

The requirement of storage volume is considered first. The receiver must be large enough to contain all of the liquid ammonia from the evaporators. In the down-feed system, if the load on all of the evaporators should be off at the same time, the ammonia in all of these evaporators would drain into the low-pressure receiver. The volume of the low-pressure receiver should be the sum of the following volumes:

$$(1.6 \times E_v \times \%E_v) + P_v^1 + (0.6 \times P_v^2)$$

where

E_v, is evaporator volume

$\%E_v$, is percent of evaporator occupied by liquid,

P^1_v, is volume of liquid mains, and

P^2_v, is volume of gas return mains

In the down-feed arrangement, the percent of volume occupied by liquid is about 25 percent of the total internal volume of the evaporator. The "1.6" factor in the equation above provides space for gas in the low-pressure receiver and thus liquid should occupy no more than two-thirds of the volume of the receiver.

Next, to satisfy the requirement of separating the gas from the liquid, the gas velocity through the shell should not exceed 200 fpm. If the velocity of the suction gas is kept to this value, the liquid will drop out of the gas stream. The separation area in the receiver can be calculated from the equation:

$$\text{Separation Area} = \frac{\text{Suction Gas Flow}}{200 \text{ fpm}}$$

Suction gas flow can be determined in this way:

$$\text{cfm} = \frac{\text{tons} \times \text{Sp. Vol.}_s \times 200}{H_s - H_l}$$

where, cfm refers to suction gas flow,

Tons, is system capacity,

Sp. Vol.$_s$, is specific volume of suction gas,

H_s, is enthalpy of suction gas, and

H_l, is enthalpy of liquid from the condenser.

In a horizontal receiver, the separation area is the segment of the circle between the liquid and the top of the shell. If the storage requirement of the receiver is satisfied, but the separation area is inadequate, the diameter of the receiver can be increased and the length decreased. The length of the receiver should usually be more than six feet. One technique that is sometimes used to decrease the separation area is to place the returns from the evaporator at opposite ends of the top of the receiver with the suction line to the compressor taking off the top-center of the receiver. By so doing, the gas velocity is cut in half.

Suction Mains

The suction line from the evaporator to the low-pressure receiver should be sized somewhat larger in the recirculation system than would be the suction line in a conventional system. The larger size is to allow additional area for the liquid to flow along with the suction gas. With a 20 psig evaporator pressure, for example, a 3-in. suction line would be adequate for 59 tons. In the liquid recirculation system, a 3-in. line would accommodate a capacity of 48.5 tons.

Control

When several evaporators are operating off the same header in a liquid recirculation system, individual control of each evaporator is possible by placing solenoid stop valves in the line serving each evaporator. As is shown in Fig. 2, the solenoid is placed ahead of the balancing valve in the line. If the evaporator is located in a freezer room, for example, a thermostat could operate the solenoid valve. When the thermostat is satisfied, the solenoid closes and the liquid in the evaporator drains from the tubes. Response to the thermostat is quick in the down-feed arrangement because the liquid immediately drains from the tubes. In the up-feed arrangement, the liquid which is in the tubes continues to evaporate.

When several evaporators are served by one header, the liquid pump may be wired so that it runs whenever one or more solenoid valves are open.

The purpose of the balancing valves is to provide some restriction in the lines of lowest pressure drops so that all of the evaporators are fed with liquid. These balancing valves, which are not strictly expansion valves, are usually hand operated needle valves which are set when the system is first put into operation and require little adjustment thereafter. The hand-operated valves require less maintenance than float or thermo-

static valves. So, in liquid recirculation, maintenance costs are cut by using one large float valve at the low-pressure receiver rather than a number of smaller controls at the individual evaporators.

Hot-Gas Defrost

With a conventional system, the operator of the refrigeration plant usually has a few anxious moments when he switches from hot-gas defrost back to normal operation. In the first few minutes after defrost, the suction gas may carry some slugs of liquid back to the compressor unless the operator changes the settings of the valves carefully. Also, in the conventional system, if liquid remains in the evaporator from refrigeration operation, the hot gas has no chance to heat the evaporator surfaces by direct contact. Heat must flow by conduction from the gas to the liquid and then to the tubes to melt the frost.

With liquid recirculation, the evaporator is first freed of its liquid by closing off the solenoid control valve and forcing the liquid down into the low-pressure receiver by opening the hot gas line (see Fig. 2). When all of the cold liquid has drained out, a valve between the evaporator and the low pressure receiver is closed so the hot gas enters the evaporator and condenses at a high temperature and pressure. To revert to refrigeration operation, the hot gas valve is closed, the drain valve opened, and the evaporator is ready for the solenoid to open.

Installation Described

A mechanical-pump type of liquid recirculation system was installed in the Horticulture Field Laboratory at the University of Illinois in 1952. A photograph of this building is shown in Fig. 3. Some of the details of the liquid recirculation equipment are described here to show a typical application.

Westerlin and Campbell Co. (now York Corp.'s Central District) was the contractor for this installation which replaced an existing carbon-dioxide system. The University had been using tap water in the condensers with the carbon-dioxide system. When evaporative condensers were to be installed to conserve water, the plant was converted to ammonia since the water temperature on summer days would be too high to condense the carbon-dioxide. The evaporator pipe coils in the cold rooms were retained.

Three rooms on the first floor and one room in the basement are maintained at about 32 F. Seven rooms on the second floor are designed to operate as low as minus 40 F and are served by the recirculation system.

A two-stage compression system provides the refrigeration. Two York four-cylinder machines are the high stage compressors and pump suction gas from a flash tank which contains liquid ammonia at 10 F. Two booster compressors, both of which are York six-cylinder compressors driven by 20-horsepower motors, pull suction gas from the low-temperature system and bubble it through the liquid in the flash tank to desuperheat the gas before it goes to the high-pressure compressor.

Fig. 3. — Horticulture Field Laboratory at the University of Illinois. A liquid recirculation system in this building serves seven cold rooms at minus 40 F.

Recirculation Equipment

The details of the low-temperature equipment and the recirculating arrangement are shown schematically in Fig. 4. High pressure liquid at the condenser pressure first passes through a cooling coil in the flash tank and then enters the low pressure receiver through a solenoid valve and a hand expansion valve. This inlet line is shown entering from the left side of Fig. 4. The liquid feed switch in the float switch column maintains a constant liquid level in the low pressure receiver. Should the switch fail to function properly, however, and the low-pressure receiver fill up, the alarm switch sounds an alarm in the machine room.

Liquid from the leg of the low-pressure receiver feeds either of the two liquid recirculating pumps. Only one of the pumps is used at a time so that the other is available for standby service. A photograph of one of the pumps is shown in Fig. 5. The pump in the photo was not in service when the picture was taken. The pump in service would be covered with frost several inches thick.

Pumps are York gear pumps, each having a capacity of 20 gpm. In starting, the pumps may be vapor bound, so to let liquid drain into the pump, the vent line to the return side can be opened. The discharge lines from the two pumps tie into a common two-inch liquid line which goes to the evaporators. Relief valves, which are set to open at 15 psi, are located in by-pass lines between the pump discharge and return lines from the evaporators. Should flow become blocked, the pump pressure builds up and opens the relief valve.

The liquid line to the evaporators serves 19 banks of coils in the seven low temperature rooms. Each bank

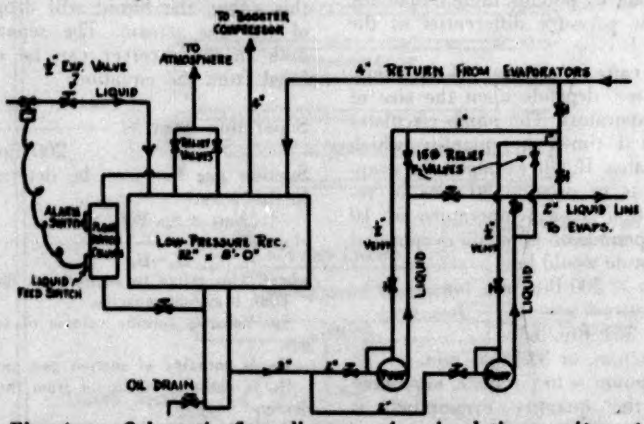


Fig. 4. — Schematic flow diagram of recirculating equipment at Horticulture Field Laboratory, University of Illinois.

of coils is fed from the liquid header through a ½-in. solenoid valve and a ½-in. hand expansion valve. Each bank drains into the four-inch return line and the mixture of ammonia liquid and vapor drains back to the low-pressure receiver.

The liquid recirculation system is especially adaptable to a low temperature system such as this. The operating temperatures are about minus 60 F in the low-temperature portion of the plant, and the pressure drop in the evaporator lines could be a severe penalty to the plant efficiency. The liquid recirculating pump, however, overcomes the pressure drop by pumping the ammonia in liquid form with very little expenditure of power.

Part II — The Watkins Recirculator

A different method of recirculating liquid ammonia through the evaporator is to collect the excess liquid returning from the evaporator, and then recirculate the collected liquid back through the evaporator by periodically impressing high-side pressure on the liquid. This section of the article describes a system of this type which is designed by the J. E. Watkins Co. of Maywood, Illinois.

Operation of Recirculator

The function of a Watkins Recirculator in a refrigeration plant and its relation to the high-side and evaporators is shown in Fig. 6. During a portion of the operating cycle, liquid from the high-pressure receiver feeds through expansion valves into the evaporators as in a conventional system. A difference, however, is that these expansion valves are set to flood some liquid out of the evaporator. The liquid and gas leaving the evaporator separate in the accumulator—the saturated suction gas returning to the compressor, and the liquid draining down into a smaller drum called the pumper.

Referring to a close-up of the recirculator equipment, Fig. 7, Valve No. 1 is open when the evaporators are fed from the high-pressure receiver. Liquid from the accumulator drains down through Valve No. 3. To allow free drainage, an equalizer line through Valve No. 2 permits the displaced gas from the pumper to vent to the accumulator. Valve No. 4 in the line from the top of the high-pressure receiver is closed.

When the liquid level in the pumper rises to a pre-set point, the pumper goes into action. Simultaneously, Valve No. 1 closes which stops the flow of liquid from the high-pressure receiver; Valves No. 3 and No. 2 close to isolate the pumper from the accumulator. Valve No. 4 opens to put high-side pressure on the pumper, pushing liquid out of the pumper through the check valve to continue the supply of liquid to the evaporators. When the level in the pumper drops to another control point, all valves revert to their original position and the evaporators are once more fed from the high-pressure receiver.

The frequency of pumping depends somewhat upon the refrigeration load, but at the rated conditions the draining operation may take about two minutes and the pumping phase of the cycle may take one minute.

Tell-Tale Nipples

The level of the liquid in the pumper starts and stops the pumping operation through suitable controls. Float switches may sense the liquid

Fig. 5 — One of two liquid recirculating pumps at the University of Illinois Horticultural Field Laboratory.

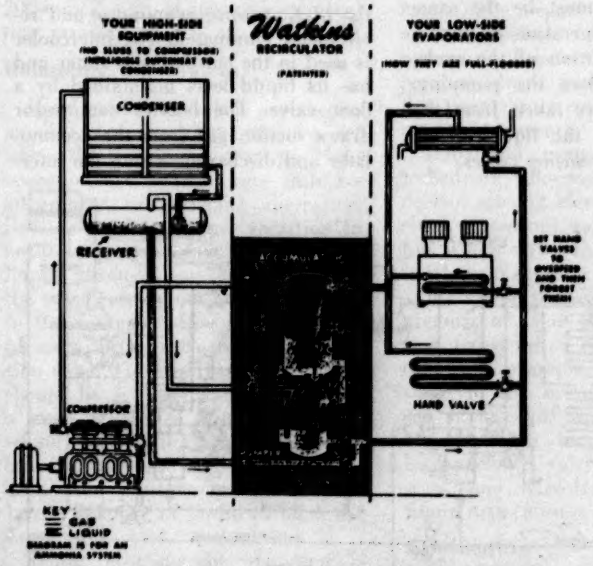


Fig. 6. — Use of reverse print (white on black) shows position of a Watkins type liquid recirculator in a refrigeration system.

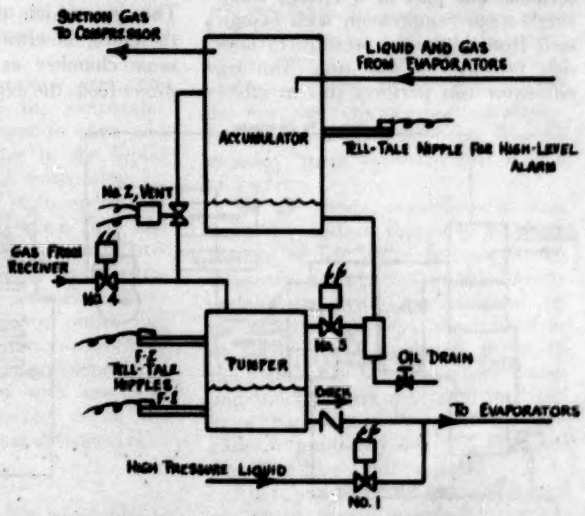


Fig. 7. — Schematic diagram of pumping system for Watkins recirculator.

level, or unique tell-tale nipples, which Watkins installs on many jobs, may operate relays through temperature controls.

The tell-tale nipples are made of 1¼-inch pipe, connected into the pumper at the levels at which pumping is to start and stop. The outer ends of these pipes are capped shut and the temperature sensing bulb of a thermostat fastened near the end of each pipe. The thermostats in turn operate a relay which opens and closes the associated valves.

The temperature setting of each thermostat is made so that the thermostat detects whether liquid or gas is present on the inside of the nipple to which it is attached. When, for example, tell-tale nipple F-2 in Fig. 7 fills with liquid, the temperature drops sharply and causes the relay to start pumping operation. During pumping, the liquid level drops and as soon as gas fills nipple F-2, heat from the machine room warms the bulb and the thermostat contacts switch back to their original normally open position. The thermostat on nipple F-1 stops pumping operation when the liquid level drops below F-1 and the nipple fills with gas.

A tell-tale nipple placed on the accumulator functions as an alarm switch to warn of high liquid level in the accumulator. Not only does the switch turn on a warning light in the machine room, but it closes Valve No. 1 as well. With Valve No. 1 closed, no more liquid enters the low side and the level of liquid in the accumulator does not reach a dangerously high point.

Reduced Pressure Systems

The basic recirculator, just described, was part of a system using single-stage compression with expansion from high-side pressure to low-side pressure in one step. The recirculator can perform just as effectively using an intermediate pressure. An intermediate or reduced pressure is available, for example, when a flash gas economizer is used in single or multi-stage compression.

Single-Stage with Economizer

The diagram in Fig. 8 shows how the recirculator is adapted to a system using single-stage compression and an economizer. The purpose of an economizer in this system is to remove most of the flash gas immediately in the machine room without sending it through the evaporators and suction lines where its only effect is to increase the pressure drop.

Liquid from the high-pressure receiver flows into the reduced-pressure economizer through a pressure regulating valve—not a float valve. The level of the liquid in the economizer is maintained by a float switch which opens a valve to vent the flash gas from the economizer. When the vent valve opens, the pressure in the economizer drops. The pressure regulating valve then opens to maintain the economizer pressure at the desired point and in so doing feeds in liquid. The vent valve releases the flash gas to the accumulator which in turn feeds it to the suction line of the compressor.

The accumulator and pumper are arranged as they were in one-step expansion, and the only difference in their operation is that the reduced pressure alternately comes on the pumper to force liquid back through the evaporator.

The pressure of the liquid to the expansion valves must be the same during pumping operation as during the direct-feed portion of the cycle. The gas which does the pumping, therefore, is always taken from the same chamber as the liquid which direct-feeds the expansion valves.

Multiple-Pressure Evaporators

Two recirculators can serve evaporators which operate at two different pressures in the same system. Fig. 9 shows how evaporators at high and low pressures can be handled by two recirculators. A system such as this would be used, for example, in a dairy where high-pressure evaporators cool milk or ice-cream mix, and the low-pressure evaporators serve the hardening rooms for ice-cream. Another system of this type is used in Florida in a juice concentrating plant. The high-pressure evaporator chills juice in a cold-wall tank and the low-pressure evaporator freezes the concentrate.

Liquid from the high-pressure receiver feeds the intercooler through float-switch Valve No. 5 which maintains the liquid level in the intercooler. The intercooler serves as the accumulator for the high pressure recirculator. The liquid from the receiver also flows through Valve No. 1 and into the high pressure evaporators. Liquid from the receiver is chilled in the coil of the intercooler-recirculator and then supplies the low pressure evaporators and recirculator. The booster compressor pumps from the accumulator in the low-pressure recirculator to the intercooler.

Two-Stage with Intercooler

The recirculator can be adapted to a system which has low-temperature evaporators only and uses a two-stage compression system with an intercooler. Such a system would essentially be the same as Fig. 9 with the high-pressure evaporator and recirculator eliminated. The intercooler is used in the customary manner and has its liquid level maintained by a float valve. The booster compressor draws suction gas from the accumulator and discharges it into the inter-

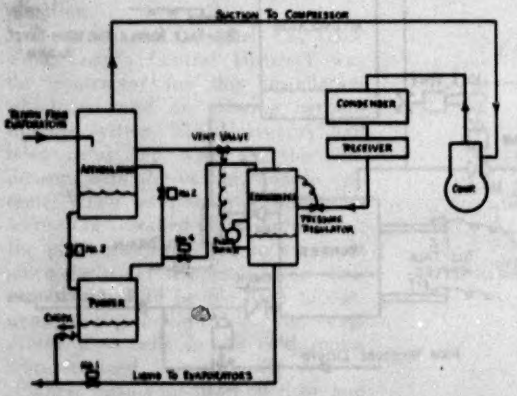


Fig. 8. — Recirculator in a single stage system with a flash gas economizer.

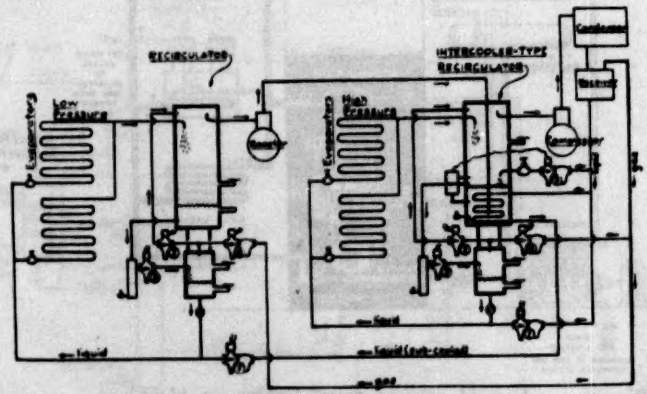


Fig. 9. — Recirculator feeding both low and high pressure evaporators in a two-stage system.

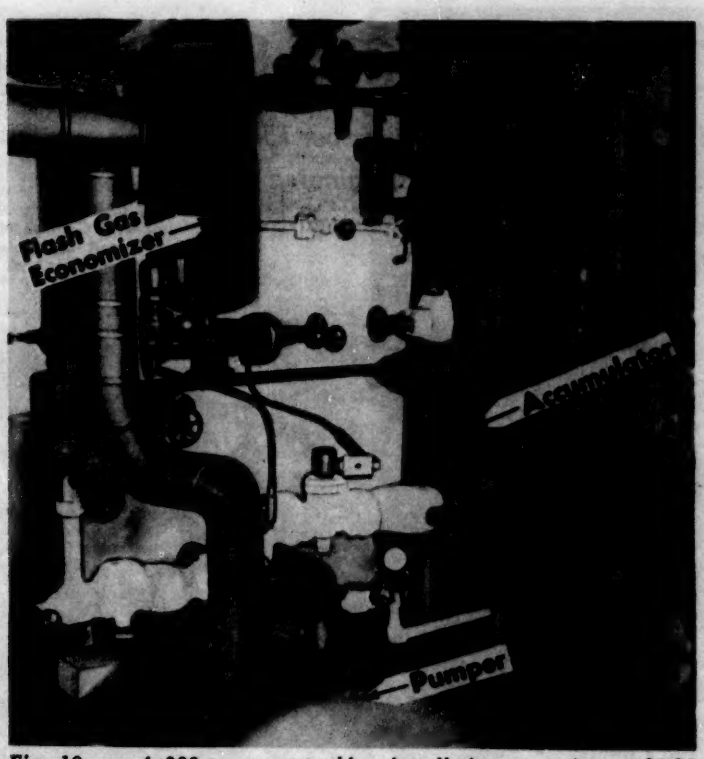


Fig. 10. — A 300-ton meat-packing installation operating at 25-30 psig suction pressure and 50 psig flash gas pressure. The pumper drum is beneath the floor because of limited head room.

cooler. The high pressure compressor pumps from the intercooler to the condenser. High pressure is again imposed on the liquid in the pumper during pumping operation.

A two-stage system with an intercooler is used in a Chicago frozen food storage house. The plant is of 200-ton capacity at zero psig evaporating pressure.

Balancing the System

Hand expansion valves are recommended because they can be set when the system is first put into operation and require very little readjustment or servicing thereafter. Because of the seasonal variation in head pressure, valves set to flood liquid through the evaporators in the summer may not adequately feed in the winter because of the smaller pressure difference across the expansion valve. For this reason, the valves should be set to flood through just a small amount of liquid during the winter when the head pressure is low. During the summer, then, the high head pressure merely floods a larger quantity of liquid through the evaporators.

Better economy in operation is possible during the winter compared to the conventional system where the head pressure must sometimes be artificially kept high to force sufficient liquid through the expansion valve orifices.

In setting the expansion valves, the best way to assure that liquid is flooding through the evaporators is to measure the surface temperatures of the outlet tubes of the evaporators. The expansion valve serving any evaporator can be gradually opened until the outlet ammonia temperature drops down to the saturation temperature corresponding to the ammonia pressure.

Individual evaporators are controlled by allowing the evaporator control sensing element to open and close a solenoid valve in the liquid line which serves that evaporator.

If an evaporator is to operate at a higher suction pressure than the pressure of a low-side system to prevent freeze-up or excessive dehydration, for example, a back-pressure valve in the evaporator outlet line can be used as in the conventional system. With the development of back-pressure valves with saw-tooth seats, any wire-drawing which the liquid may cause is not detrimental.

Application

A system must be adaptable to meet the peculiar load or space requirements of a plant. The accumulator is normally placed in a vertical position although it can be mounted horizontally if head-room is limited. Unusual space limitations were conquered in a 300-ton Chicago meat packing plant by burying the pumper drum in the floor, as shown in Fig. 10.

The Watkins Recirculator has in one instance operated to a temperature as low as minus 60 F. Remarkable improvements in performance have been reported in other instances. Many operators have reported their ability to perform their refrigeration job in less time after installing a recirculator, or to shut down some of their compressor capacity and still carry the refrigeration load.

Acknowledgements

This article was prepared with the assistance of Mr. Ira Lounsbury of York Corporation, Peoria, Illinois and Messrs. J. E. Watkins and Russell Bass of the J. E. Watkins Company.

References

Walker, G. H. — "The Liquid Ammonia Recirculation Low Side Applied to Small Cold Storage Plant", N.A.P.R.E. Operating Data Book August 1945, p. 51.

Watkins, J. E. —"The Automatic, Internal Liquid Recirculating System", N.A.P.R.E. Operating Data Book, 1949, p. 49.

EDITOR'S NOTE: Professor Stoecker continues his discussion of liquid NH_3 systems in December INDUSTRIAL REFRIGERATION, with details of several manufacturers liquid return units.

Fire Prevention Literature

OCTOBER Fire prevention publicity included an announcement by the National Board of Fire Underwriters of several new publications on fire and engineering standards. In "Facts & Trends", the Board's monthly, there appeared this advice and offer:

"In all plants, regardless of size, there are certain things to be done in case of fire or as fire prevention measures. In well-run establishments certain employees are assigned by the manager or department head to do them. These employees make up the plant's fire brigade, whose duties and functions are described in detail in a pamphlet, "Private Fire Brigades," published by the National Board of Fire Underwriters."

That pamphlet is among several put out in recent months by the National Board's engineering department.

International Congress of Refrigeration

Ninth International Meeting Held at Paris August 31-September 15 Almost Fifty Years After First International Congress Originated in Paris—Fifteen Hundred Refrigeration Experts From 52 Countries Discuss the Newer Aspects of Refrigeration

L. Klimek
Imperial College of Science and Technology, London, England

A view of the opening session Ninth International Congress, Paris, France

IT WAS almost 50 years ago, in 1908, in the same Grand Amphitheatre of La Sorbonne Paris that the First International Congress of Refrigeration was inaugurated..... said Monsieur Dr. H. Queille, former French Prime Minister and Chairman of the French Association of Refrigeration, who welcomed the Congress Members in the name of the President of the French Republic.

Ampitheatre Filled

The Great Amphitheatre of the Sorbonne was filled to capacity. About 1500 refrigeration experts, representing 52 countries of West and East stood to attention as "La Marseillaise" was played. Professor R. Plank, until recently head of the Refrigeration Institute of Karlsruhe, West Germany, and who is well known in the United States, was the second principal speaker. In his address on "Hundred years of Refrigeration Industry", he reminded the audience of the history and developments of the mechanical production of low temperatures tracing it back to the early experiments of pioneers like W. Cullen and Sir John Leslie.

Very Low Temperatures

Professor C. J. Gorter of Holland, Director of the famed Kammerlingh Onnes Laboratory of Leiden then presented and discussed developments in the field of very low temperatures bordering on the absolute zero. W. S. Douglas of Great Britain and president of the Organizing Committee of the 1951 Congress in London presented his best wishes for the success of the Congress. The First International Congress was held in Paris in 1908 and the subsequent ones in Vienna, 1910; Chicago, 1913; London, 1924; Rome, 1928; Buenos Aires, 1932; The Hague, 1936; Finally, Monsieur Sourbet, the French Minister of Agriculture, stressed the importance of refrigeration techniques in the field of food preservation quoting, as an example, the efficient way in which the Americans transport all their food from California to the Atlantic coast in a refrigerated state.

Nine Commissions

After the opening ceremony the Congress Members left in order to take up work with one or other of the nine commissions set up to discuss the 210 papers submitted. The topics ranged from hydrogen and helium liquefaction to the precooling of fruit before storage, the work and Chairman of each Commission being as follows:

Commission 1—Scientific and technological problems relating to very low temperatures. Prof. Sir F. Simon, Gr. Britain

Commission 2—Heat transfer. Insulating materials. Instrumentation. Dr. E. Griffiths, Gr. Britain.

Commission 3—Refrigerating equipment and installations. Compressors, evaporators, condensers. Refrigerating cycles. Prof. P. Glandsdorff, Belgium.

Commission 4—Application of refrigeration to food storage Dr. J. C. Fidler, Gr. Britain.

Commission 5—Construction and operation of cold stores. Dry ice. M. L. Fontanel, France.

Commission 6—Technical problems in air conditioning. Refrigeration in the chemical industry and in medicine. Prof B. del Nunzio, Italy.

Commission 7—Refrigerated land and air transport. Construction and operation of refrigerated vehicles. Dr. D. Palmieri, Italy

Commission 8—Refrigerating installations on board ships. H. R. Howells, Gr. Britain.

Commission 9—Education in the field of refrigeration. Prof. M. S. Andersen, Denmark.

In addition, special sessions were devoted to the problems of treatment of air in cold chambers and to the precooling of food before storage.

Fractionation Of Air

A most interesting paper, with demonstration, was presented by Dr. J. W. Kohler of the Philips Laboratories at Eidhoven, Holland. He described the development of the famed Philips gas refrigerating machine to the fractionation of air, in which the cold gas engine not only liquefies air but also condenses nitrogen at the top of the fractionating column. As is well known, in the Philips gas engine which runs on the Stirling cycle, a constant quantity of gas refrigerant, hydrogen for the purposes of air liquefaction, is compressed and expanded in a space between two pistons, moving harmonically in the same cylinder. The hot and cold temperature levels of the closed cycle are bridged by a regenerator the cold being produced on the expansion stroke of one of the pistons. For air fractionating, cold is required to liquefy the ambient air and to supply the cooling load of the condenser of fractionating column to provide the necessary reflux.

In Dr. Kohlers' arrangement, the amount of reflux is automatically controlled by the method illustrated in Fig. 1. Liquid N_2 condensate enters pipe I from the Philips machine which is acting as the condenser and is split into the reflux and product steam by the two vapor lift pumps 2a and 2b. The heat leak into the "pumps" is obtained by exchange, via the copper sheets 6a and 6b with the vapors escaping from the sump 3. When the reflux becomes excessive, the level in the sump rises and shuts the entrance 7 of the pipe 4a to the escaping O_2 vapors. This reduces the heat leak into the pump 2a and hence the amount of reflux supplied to the top of the column. In contrast to many methods of air fractionation, the Philips machine enables the liquefaction and fractionation to be carried out without compression of the air. The fractionator described had a capacity of 5.5 liters/hr of N_2 and the power consumption was stated to be 1.1 kwhr/liter.

Professor R. Plank speaks on "A hundred years of the refrigeration industry."

Liquefaction Of Chlorine

An industrial installation for the liquefaction of chlorine was described by Dr. E. Emblik of the Sulzer Company of Winterthur, Switzerland. The present methods of liquefying chlorine are by external refrigeration at −45 C and atmospheric pressure or at −20 C and 3 atmospheres absolute. In the method described by the author, precooled chlorine gas is compressed in two stages to 12 atmospheres absolute and liquefied by cooling water. To eliminate corrosion problems at high temperatures, the gas is cooled between stages and also before first stage of compression by flashing about 10 percent of the liquid chlorine product into the gas streams.

Thermal Insulation

Recent developments in thermal insulation were reviewed by Dr. E. Griffiths, Chairman of the Second Commission. Cork continues to occupy an important place in the field of insulation. Recent developments in this field include the production of cork slabs of lighter density which may result in lower cost per unit area of surface insulated. Mineral wool is holding its place. By suitable treatment, it can be made water repellent. Glass fiber has been improved by making the fiber of smaller diameter. Cellular cement is nowadays being used to an increasing extent for the insulation of fruit stores.

A variety of cellular materials of the plastic class like polyvinyl-chlorides, polystyrene and urea formaldehyde have appeared in slab form in recent years. Silica aerogel continues to be used for very low temperatures, for insulation of liquid oxygen. Granular materials made by heating minerals of the obsidian class are also used for very low temperatures. One of these known as Perlite is obtainable in densities down to about 3 lb per cu. ft.

Measurement Of Temperature Humidity And Air Movement

In the field of instrumentation, temperature, humidity and air movement are the three physical quantities which the refrigerating engineer has to measure most frequently. As far as temperature measurements are concerned, it is likely that the moving coil galvanometer in bridge circuits will be replaced by electronic devices, as is already the case in temperature recorders working in the high temperature range. In the humidity field, methods based on the electrical resistance charge of lithium chloride solution, or a ceramic material, are

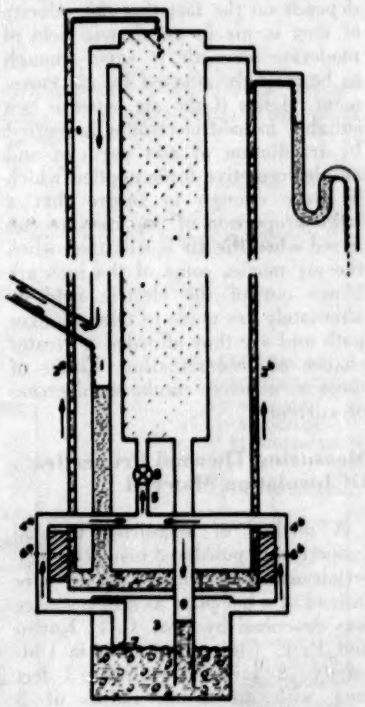


Fig. 1—Diagram showing automatic control of reflux in gas refrigerating machine.

Opening Session in Grand Amphitheatre of LaSorbonne, Monsieur H. Queille, President of the Congress, welcomes members in name of the President of the French Republic.

being developed. The change of electrical capacity of the anodized layer of an aluminum wire is the basis of another hygrometer. This principle is described in some detail in the second following paragraph.

In a modified form of the classical dew point hygrometer, the following technique is used to detect the deposition of ice. A vibrating element sweeps to and fro over the surface on which the hoar frost forms. When there is a deposit of ice, the electrical resistance at the point of contact of the vibrating reed with the surface becomes very large and this constitutes the indication of the hoar frost point. In the field of measurement of air currents, the following instrument was described. It depends on the fact that the velocity of ions in air in an electric field of moderate strength is small enough to be strongly affected by air movement. Hence if the air between two suitably formed electrodes is ionized by irradiation of alfa particles and an electromotive force applied which is large enough to insure that a large proportion of the ions are collected when the air is still, then when the air moves, some of the ions are blown out of the electric field or alternately are made to take a longer path and are thus afforded a greater chance of recombination. Either of these occurrences results in a decrease of current.

Measuring Thermal Properties Of Insulation Material

A method of measuring thermal properties of powdered insulating materials using electrically heated wire instead of a hot plate as a heat source was described by Prof. C. F. Kayan and P. E. Glaser of Columbia University. A jacketed cylinder 3 feet long with an inside radius of 5 inches, held at constant temperature by circulating oil, with a Constantan heater wire along the axis of the cylinder, was filled with the powdered insulator. Thermocouples were located in the insulation bed in various distances from the heater.

This method, originally introduced by Schleiermacher, has been further developed to allow for investigation of the influence of such parameters as pressure, temperature and density on thermal properties. In addition, it has been found possible to calculate thermal diffusivity from the data. The range studied was from 70 to 300 F. To illustrate the dominating effect of gases on conduction of heat through an insulating powder, tests were carried out with Celite, calcined diatomaceous earth and helium, ammonia and air. The results are shown in Fig. 2.

Psychrometric Charts

A new approach to the construction of psychrometric charts was proposed by B. H. Jennings of Northwestern Univ., Evanston, Ill. Most psychrometric charts used at the moment have the disadvantage of being calculated assuming ideal gas laws and the Gibbs-Dalton principle disregarding changes in altitude. Consequently, the author presented a set of charts for pressures of 706.6 mm Hg and 632.2 mm Hg, corresponding to the altitude of 610 and 1524 meters above sea level correspondingly. The equation of state for moist air used was that proposed by Goff and Gratch in 1945 in the following

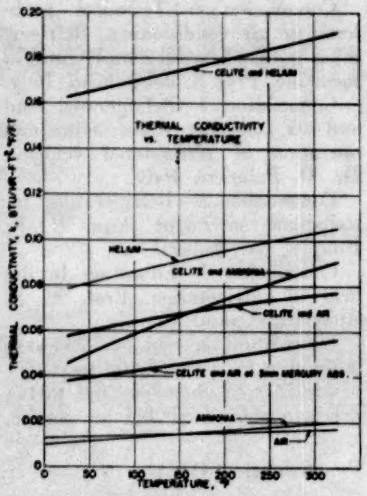


Fig. 2—Diagram showing results of tests to determine thermal properties of powdered insulating materials using electrically heated wire.

form:

$$p_{BV} = R\,T - p_B\,[x^2 A_{aa} + 2x(1-x)A_{aw} (1-x)^2 A_{ww}] - p_B^2 [(1-x)^3 A_{www}]$$

where

- x = mole fraction of dry air per mole of mixture
- $1-x$ = mole fraction of water vapor per mole of mixture
- p_B = total pressure in consistent units
- R = Gas constant
- T = temperature in degree Kelvin or Rankine
- v = volume
- A_{aa}, A_{ww}, A_{aw} and A_{www}, A_{aaw}, A_{aww} are second and third virial coefficients.

This equation is based on statistical mechanics considerations taking into account the interaction of intermolecular forces. The discrepancy between results obtained by the orthodox and the statistical approach is negligible at 0C, but is considerable at higher temperatures, as is shown in Table 1. Three complete charts using metric system units are presented.

Heat Flow Analysis By Electrical Analogy

Prof. C. F. Kayan, in another paper, demonstrated the use of electrical resistance analysis for study

TABLE 1 — COMPARISON OF THERMODYNAMIC PROPERTIES OF MOIST AIR COMPUTED BY PERFECT-GAS RELATIONS AND BY METHODS OF STATISTICAL MECHANICS FOR REAL GASES. COMPUTED AT 760 MILLIMETERS OF MERCURY FOR MOIST AIR AT SATURATION.

	Enthalpy kcal per kg of dry air		Specific Volume m³ per kg of dry air		Specific Humidity grams/kilogram	
Temperature °C	By Perfect Gas Laws	By Statistical Mechanics	By Perfect Gas Laws	By Statistical Mechanics	By Perfect Gas Laws	By Statistical Mechanics
0	2.263	2.262	0.7786	0.7780	3.722	3.789
10	7.011	7.008	0.8120	0.8116	7.626	7.630
30	23.880	23.874	0.8965	0.8961	27.185	27.307
50	65.730	65.719	1.0431	1.0423	86.258	86.780

Commission 2 at work. This commission is concerned with heat transfer and instrumentation.

of combined mass and heat transfer processes, as is the case in humidification. As is well known, if wet unsaturated air passes over wet surface, the temperature of the latter stabilizes at t_w— "wet bulb temperature" which is between the "dry bulb temperature" t_D of the mixture and the "dew point" t_s of the air mixture. This is the principle of the humidification process, heat being supplied by the mixture to evaporate some of the water; in other words, a simultaneous heat and mass transfer process — the driving force for the transfer being $\triangle t$ and $\triangle P$ respectively, as seen from Fig. 3.

The ratio of $\triangle P/\triangle t$ is constant over a wide range of temperatures and pressures, the slopes of the "wet

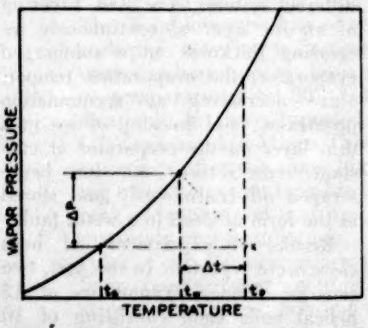


Fig. 3—Chart of simultaneous heat and mass transfer process.

bulb temperatures" lines of a psychrometric chart being approximately constant at 0.01067 for normal ranges of air conditioning operations. Assuming equilibrium, the heat transfer rate, Btu/hr will be $Q_u = B\triangle t$, which will be equal to the heat flow rate, associated with surface evaporation, Btu/hr $Q_p = C\triangle P$ where B and C are constants combining conductance coefficients. As conductance is proportional to the reciprocal of resistance, the above equations can be written as $Q_u = \triangle t/R_u = Q_p = \triangle P/R_p$

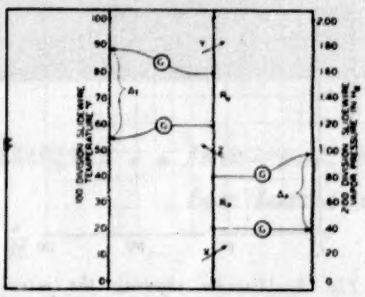


Fig. 4—Electrical Circuit incorporating temperature and vapor transfer Resistivities with ballast and adjusting resistances.

R_u and R_p being the thermal and vapor flow resistance respectively. This is in striking similarity with Ohms law $I = V/R$ where voltage is the driving force for the current. Fig. 4 shows an electrical circuit incorporating the R_u and R_p, temperature and vapor transfer resistivities with ballast resistances X and Y and an adjusting resistance Z. In parallel with the main circuit are the temperature slidewire and vapor pressure slidewire. By adjusting the resistance and balancing the network, the lower end connection of R_u, the temperature slidewire and the upper end connection of R_p, the vapor pressure slidewire will give the wet bulb temperature and pressure correspondingly for equilibrium conditions.

Extension Of Heat Flow Analysis

Prof. C. F. Kayan later demonstrated an extension of his heat flow analysis by electrical resistance analogy to study of the performance of a cold storage plant, represented in Fig. 5. Equivalent resistance values are used to represent compressor performance and heat flows through condenser and evaporator, expressing the compressor performance in terms of overall temperature difference. Since the fundamental equation for heat transfer is $Q = A \times U \times \triangle t$, where A = area, U = overall heat transfer coefficient and defining

$$A \times U = \frac{I}{R},$$

then the expressions for the energy flows in various sections of the plant become

$Q_c = \frac{\Delta t_{1,\ c}}{R_{t,\ c}}$ for the hourly condenser flow

$Q_e = \frac{\Delta t_{1,\ e}}{R_{t,\ e}}$ for the brine cooler evaporation

$Q_a = \frac{\Delta t_{1,\ a}}{R_{t,\ a}}$ for the brine-air cooler

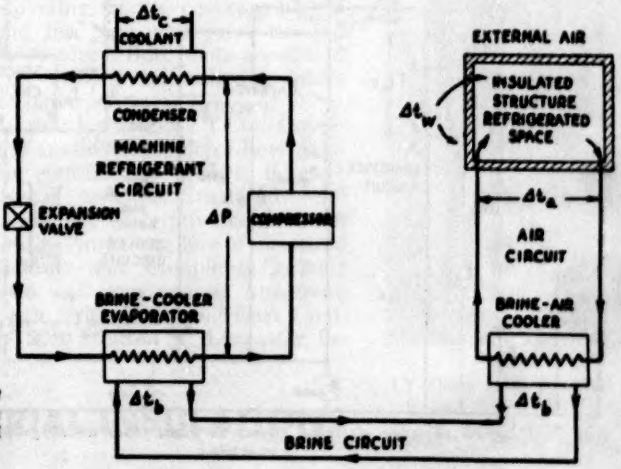


Fig. 5—Heat Flow Analysis Study of a Cold Storage Plant.

the subscripts and conditions referring to Fig. 6. The equivalent electrical circuit for the plant referred to in Fig. 6 is shown in Fig. 7. Resistances are proportional to the heat transfer characteristics and voltages to the temperature heads.

Compressor Power Requirements

Power requirements of refrigerating compressors were discussed by B. Christensen of the Atlas Co., Copenhagen. Theoretical power consumption of a compressor depends only on the lower and higher temperature limits T_2 and T_1 respectively. As required by 2nd thermodynamic law,

$$860E = Q \times \frac{T_1 - T_2}{T_2}$$

where Q is the cooling load of the evaporator in Kcal[1] and E is the motor output in kw. This is true for a fundamental Carnot cycle. In practice, however, a number of factors are encountered, depending on the nature of the refrigerant, on the efficiency of the compressor etc. In addition, it has been found that the indicated efficiency of a given compressor is fairly closely related to the pressure ratio, hence also to the temperature ratio T_1/T_2

Tests were carried out with a number of compressors rated from 25 to 190 hp with ammonia and Freon 12 as refrigerants to test the dependence of the total compressor efficiency on the temperature range. It is seen from Fig. 8 that the maximum efficiency is obtained at a T_1/T_2 ratio of about 1.15

[1]A KCAL (kilogram calorie) is equivalent to 3.968 Btu's.

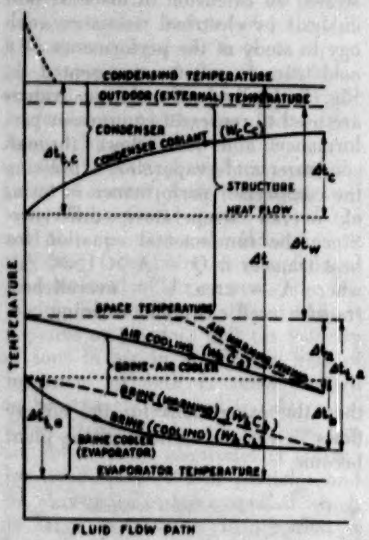


Fig. 6—Graph showing energy flows in various sections of cold storage plant.

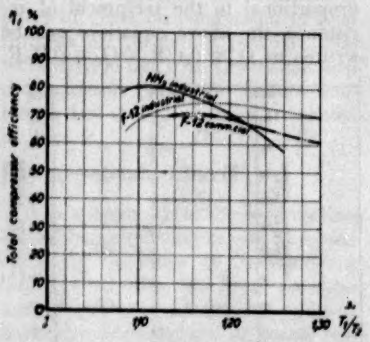


Fig. 8—Diagram showing the actual total efficiency curves for a number of compressors investigated.

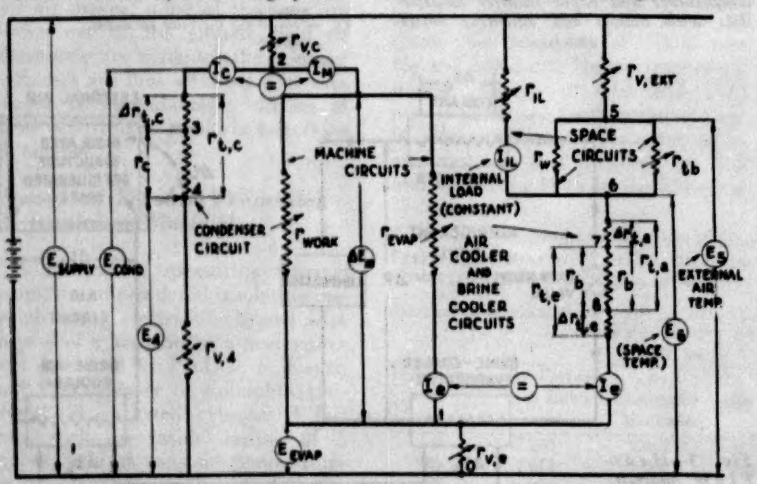


Fig. 7—Diagram showing electrical circuit in plant from which graph in Fig. 8 was compiled.

Capacity Of Large Scale Refrigerating Compressors

An improvement of the present measurements of capacity of large scale refrigerating compressors was proposed by Dr. A. J. Barnard of Messrs. J. & E. Hall, Gr. Britain. The present orifice methods suffers from some inaccuracies due to entrained liquid refrigerant or oil particles and also the condenser evaporator heat balance technique requires bulky equipment. The author proposes a simpler method in which a part, about 20 percent of the hp. gas refrigerant from the compressor is first liquefied by water in a separate condenser, measured in a measuring vessel and then evaporated in the shell side of the gas cooler, thus cooling the previously expanded main gas stream, which it finally joins before passing to the intake of the compressor, via a conventional orifice meter. By making a heat balance across the gas cooler, the refrigerant flow can be calculated. The circuit diagram is shown in Fig. 9.

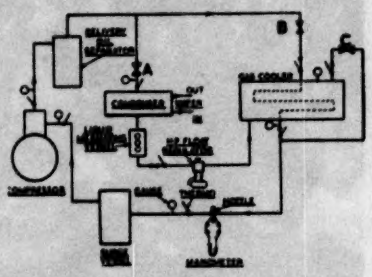
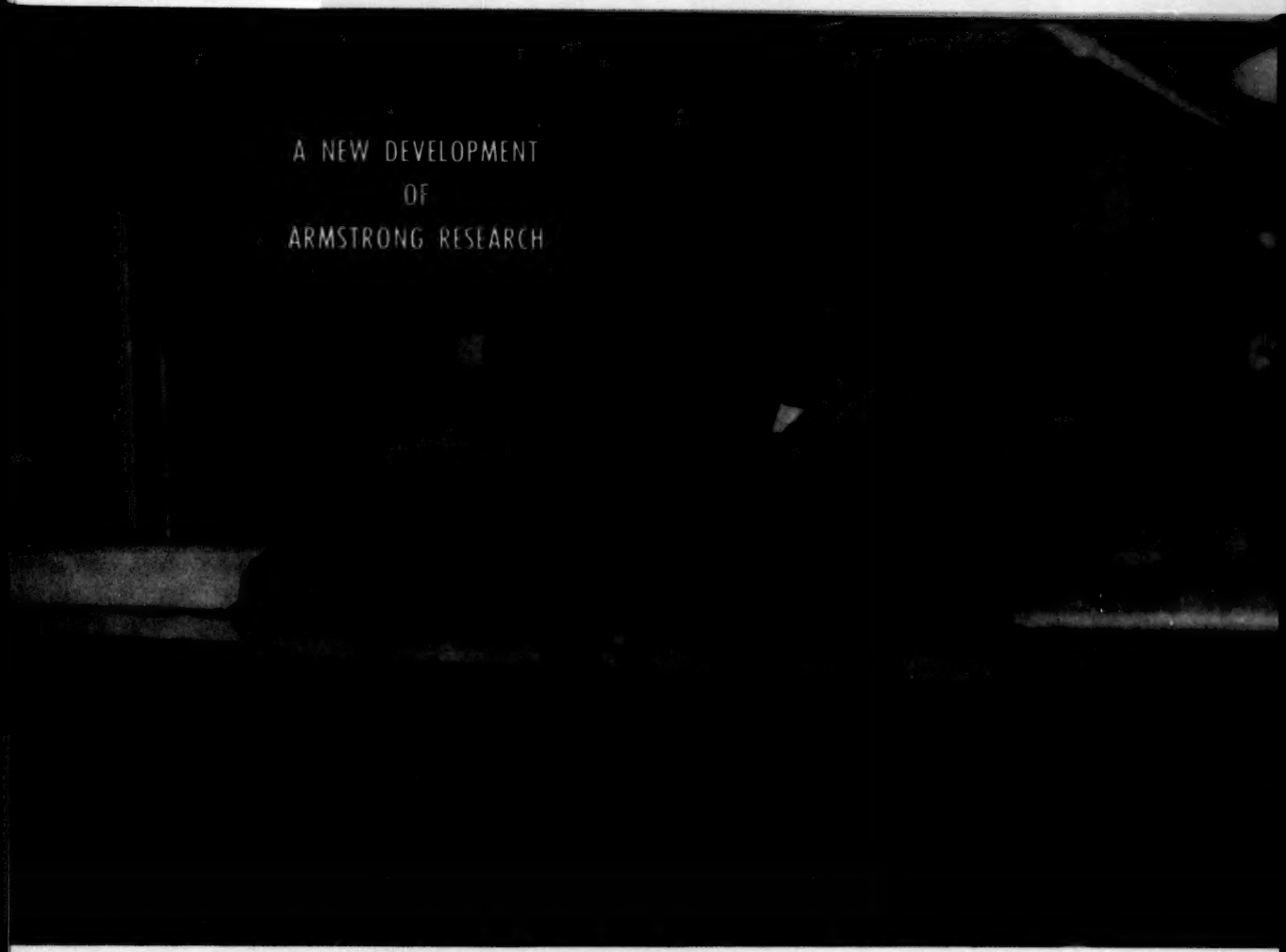


Fig. 9—Circuit Diagram for compressor testing plant.

Ice Accumulator System

G. Lorentzen and O. F. Johansen of the Trondheim University of Norway described an ice accumulator system. The object was to store cold in the form of ice during off peak hours. Quite a number of "ice banks" are already installed in the Scandinavian countries. Two fundamentally different systems were used. Freezing of an ice layer of continuously increasing thickness on a submerged evaporator, the evaporation temperature decreasing as accumulation progresses; and freezing of ice in a thin layer on the evaporator at constant temperature, the ice being scraped off continuously and stored in the form of slush in a water tank.

Results of experiments of both cases were reported. In the first, two separate flooded evaporators of 12 helical coils each consisting of 10 turns of 52/60 millimeter steel pipe with a total outside cooling surface of 281 sq. meters were tried. In the second, water was sprayed on walls of a cylinder cooled by ammonia evaporating in an annular space of the cylinder. Ice, frozen on the inner cylinder wall was continuously removed by electrically operated scrapers,



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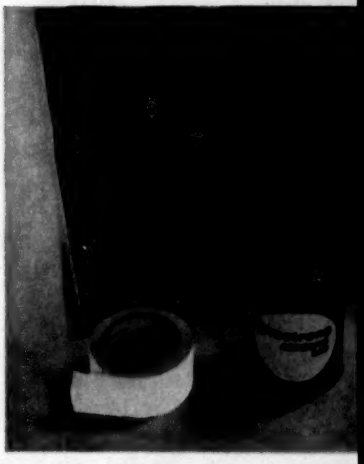

LT-Thirty Cork Covering prevents sweating under normal conditions at line temperatures of 30° F. or above. LT-Zero is suitable at temperatures down to 0° F.; LT-Minus Thirty at temperatures to −30° F.

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washed off into a tank and stored as a slush with water.

The conclusion reached was that the coil evaporator system was superior with regard to power economy, space requirements and capital expenditure, while the ice machine system with continuous removal of the ice formed had the advantage of producing a somewhat lower ice water temperature.

New Design For Fractional Horse Power Compressor

A new household refrigeration compressor was described by U. Sellerio of Italy. Normally, small refrigerating units have an electric motor directly connected to a reciprocating or rotary compressor in a single unit, in a novel way. The rotor of the electric motor is mounted eccentrically with respect to the stator and the refrigerant vapor is compressed in the annular space. Two models were developed. One with a vane on the stator, Fig. 10. and one with revolving blades, Fig. 11 the first model having the disadvantage of being more difficult to manufacture, because location of the vane leads to disfiguration of the stator and displacement of the wiring.

The second model, with revolving blades is therefore preferred. Both motor and compressor were completely immersed in a bath of lubricating oil. This had also a cooling effect. Models of power consumption up to 1/7 hp were constructed. Monophase synchronic motors of 4 poles were used. No vibrations or noise were experienced. Power consumption for Freon 12 from 25C to −10C was one kw for approximately 4000 Btu's. The efficiency at low temperatures was said to be 80 percent.

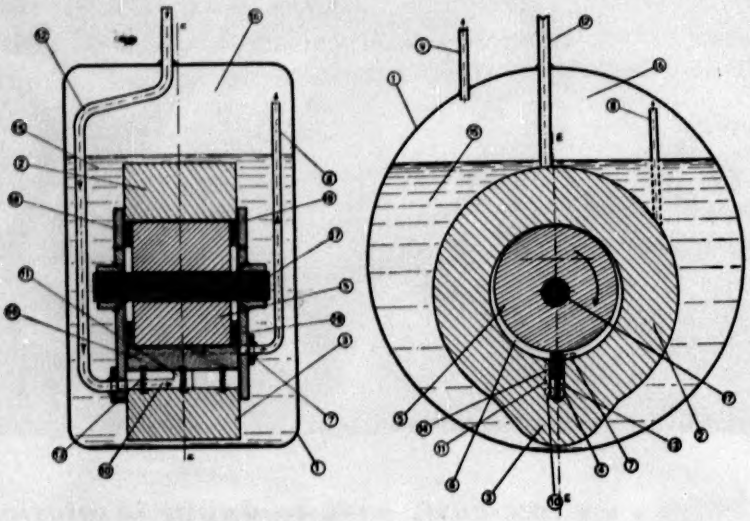

Fig. 10—Household refrigeration compressor with vane on the stator.

1. Hermetic casing. 2. Stator notches of the stator and wiring not indicated. 3. Deformations of the stator in order to house the vane. 4. Seat of the vane. 5. Rotor — notches not indicated. 6. Working space for the refrigerant. 7. Outlet of the compressed refrigerant. 8. Delivery pipe. 9. Pipe to condenser. 10. Entry of the refrigerant. 11. Junction between entry of refrigerant and suction line. 12. Suction line. 13. Seating of the vane. 14. The vane. 15. Oil for Lubrication and cooling. 16. Refrigerant-oil separator. 17. Shaft of the rotor. 18. Sheets of bronze to support the rotor and to ensure hermetic sealing of the compressor. 19. Sealing rings of the casing.

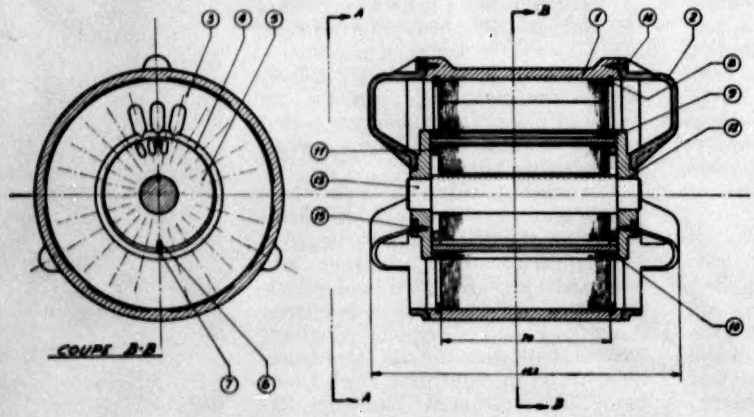

Fig. 11—Household refrigeration compressor with revolving blades.

1. Casing of the motor. 2. Structural supports. 3. Stator. 4. Ring constricting the cylinder of the compressor. 5. Eccentric rotor. 6. Seating of the blades. 7. The blades. 8. Sealing ring between the stator and the casing. 10. Tightening rings of the rotor. 11. Seals. 12. Rotor casing. 13. Eccentric shaft of the rotor. 14 and 15. Screws.

Automatic Refrigeration

The behavior of automatic refrigeration plant under regular cycling conditions was discussed by W. Gosney of London. Considering the integral heat balance methods, differential equations relating evaporator temperature, cold space temperature and time were derived. For the on-period, the author proposed the equation

$$\frac{A - Bt' + Kt}{K(t' - t) - Q} = \frac{H'}{H}\,\frac{dt'}{dt}$$

and for the off-period

$$\frac{d^2t}{d\theta^2} + \left(\frac{K}{H} + \frac{B}{H'}\right)\frac{dt}{d\theta} + \frac{K(B - K)}{HH'}\,t = \frac{AK}{HH'}$$

which may be solved either graphically or algebraically to give the relation between the amplitude of the cold space, temperature fluctuations and the differential of the pressure cut-out, or between thermostat differential and the range of the evaporator pressure swings. The symbols used are:

- t' = temperature °F of medium in the cold space surrounding the evaporator
- t = temperature of evaporating refrigerant
- K = product of evaporation surface and overall heat transfer coefficient Btu/hr °F
- K_w = heat gain due to conduction through insulation Btu/hr F
- K_p = heat gain in exchange with stored product Btu/hr F
- θ = time
- P = load, Btu/hr, due to fans, lighting respiration etc. of stored product
- T_p = temperature of product stored
- $A = P + K_wT + K_pT_p$
- $B = K_w + K_p + K$

M and N are constants.

(To be Concluded)

The December issue will include synopses of papers on Capacitance-Resistance Hygrometers; Evaporative Condenser Design; Cold Storage of Food; Refrigeration of Poultry; Fish Freezing; Refrigeration for Cheese; Control of Relative Humidity; High Humidity Systems; Distribution of Air; Technical Specifications; Industrial Application of Absorption Refrigeration; Heat Pumps on Ship; Stratochamber for Aeronautical Research; Chilling Electrolytic Solution of Zinc Sulphate.

New Prestress Concrete Structure Used on Southern Refrigerated Warehouse

DON W. KIRK
Chief Engineer
for Preston M. Geren,
Architect and Engineer
Fort Worth, Texas

RECENTLY completed in Ft. Worth, Texas is the largest warehouse in the country using prestressed concrete roof structure. This also is the first known application of prestress to cantilevered beams supporting short drop-in beams, a system that has proved to be economical in steel construction, and one which effects similar economies in prestressed concrete construction.

The building is a 163,000 sq. ft. refrigerated warehouse, for the United States Cold Storage Corp. The walls are precast concrete panels, and the roof is constructed of precast channel slabs supported on prestressed concrete beams. Thos. S. Byrne, Inc. was the general contractor.

Increased Revenue Earning and First Cost Economies

The following discussion covers the economies effected in the building layout, beam design, beam construction and stressing, through the use of prestressed concrete beams.

The owner required a basic storage unit (Fig. 1) of 193 x 49 ft, the 193 ft being the building width. This size was predicated upon the use of standard pallets, and upon the use of five lines of interior columns in the 193 ft width. The owner also suggested that if a 49 ft clear span could be used economically, the width of the building could be reduced by the sum of the widths of the omitted columns without loss of usable pallet space.

The upper plan on the side indicates the pallet arrangement with no interior columns. Note that to accommodate the 540 pallets required in the basic scheme, the building width could be reduced by 9 ft-6 inch or by using approximately the same building width, it would be possible to accommodate 567 pallets.

Sufficient preliminary design was made to get construction cost estimates on two framing schemes, as shown in Fig. 2. The lower scheme utilized cast-in-place concrete pan joists, supported on a concrete beam spanning 16 ft-4 inches. The upper scheme used precast concrete channel slabs supported by prestressed concrete beams spanning 49 ft.

Improved Fire Coverage Rate

Concrete construction was used in order to obtain advantageous insurance rates without the use of firewalls or a Sprinkler System.

Preliminary estimates indicated that the two schemes could be built for approximately the same cost per square foot, thus the prestress scheme, requiring less floor area for the same pallet storage area would be the more economical construction method for a

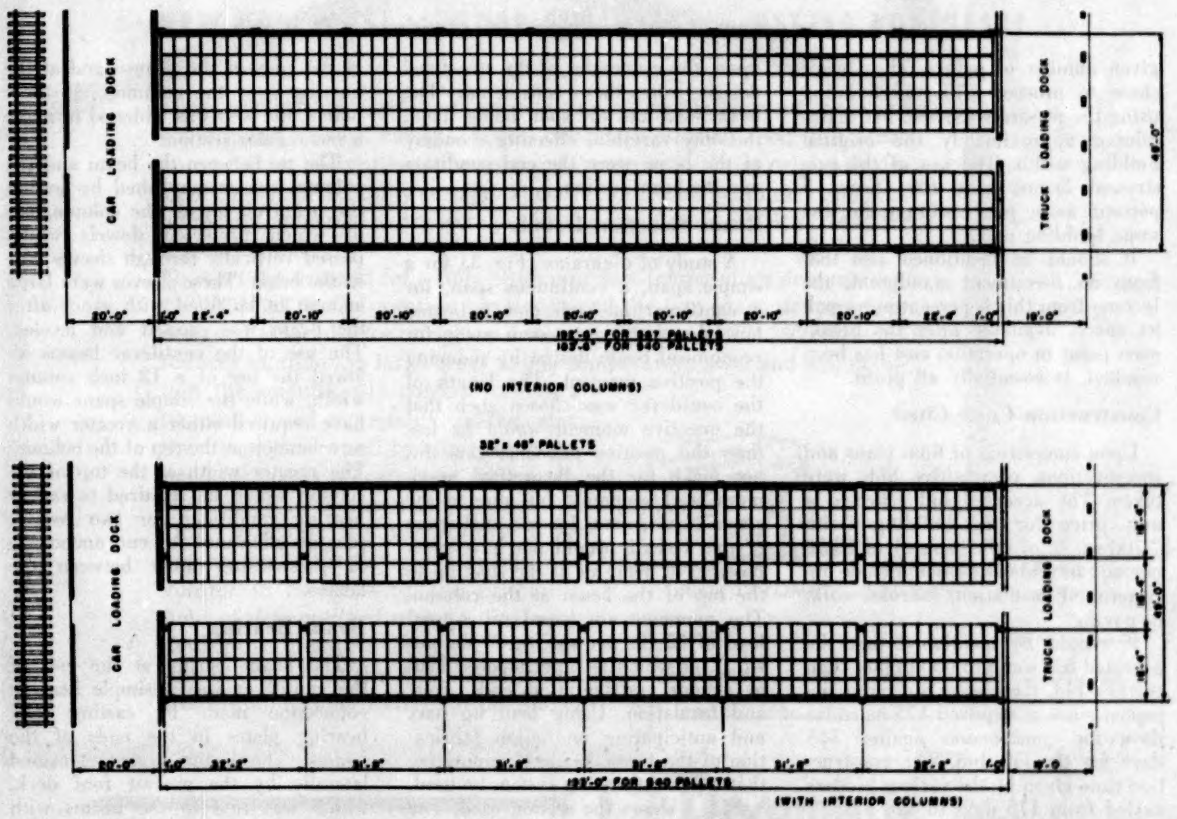

Fig. 1 — Top, desired columnless layout of storage bay for Ft. Worth U. S. Cold Storage plant. Bottom, typical structure with columns.

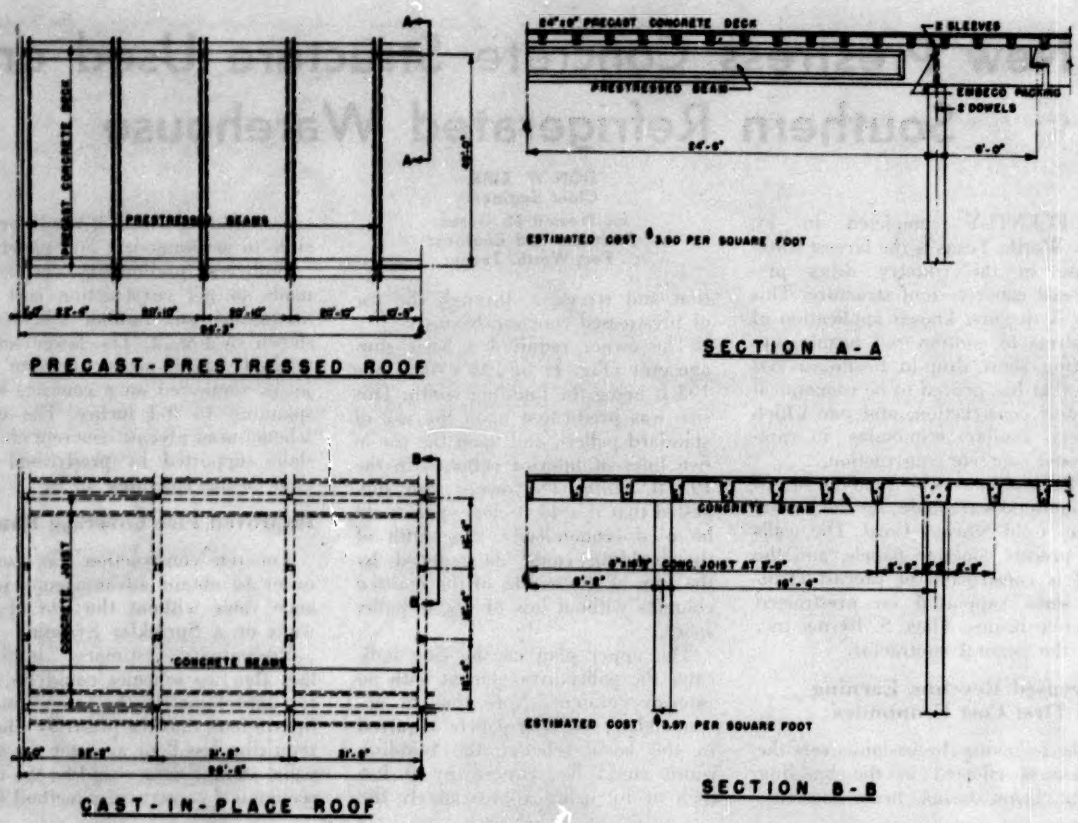

Fig. 2 — Comparison of roof framing systems considered at Ft. Worth

given number of pallets. The Owner chose to proceed with the building using the prestress scheme, but maintaining approximately the original building width. The use of the prestressed beams gave the Owner 5 percent more pallet storage for the same building cost.

It should be mentioned also that from an investment standpoint, the income from this 5 percent extra pallet space, available after the break-even point in operation cost has been reached, is essentially all profit.

Construction Costs Cited

Upon completion of final plans and specifications, competitive bids were taken. The accepted bid reflected a unit price for the building (with 7,700 sq. ft. of office space) of $3.50 per sq. ft. This does not include refrigeration, insulation, railroad work, or paving.

It should be mentioned that the accepted bid was $15,000 higher than the low bid, the higher bid being accepted since it required 175 calendar days for construction against 365 days for the low bid. The construction time given by the various bidders varied from 175 days to 420 days.

The basic building layout and the framing method having been decided upon, the economics of the structural design were then considered. The beam load and the span being fixed, the only variables effecting economy of the beam were the end condition and the beam section.

Beam Selection Details

A study of diagrams (Fig. 3) for a simple span, a continuous span, for a cantilever at each end indicated how the cantilever system made for economical beam design by reducing the positive moment. The length of the cantilever was chosen such that the negative moment would be less than the positive moment; this did not make for the theoretical maximum steel economy, but due to the space requirements for end anchorage of the wires it would not have been possible to bend all of the steel up to the top of the beam at the column. The moments are based on a total load of 85 lbs per sq. ft., 60 lbs per sq. ft. of which is superimposed load to support refrigeration coils, frost and insulation. Using bent up bars and anticipating on-the-job fabrication of the beam, made it imperative that a post-tensioning system be used.

Fig. 4 shows the section used. The same section was used on all beams on the job; the only change being at the ends of the beams, and at the bearing over the columns. At these points, the web was widened to make a rectangular section.

The tie between the beam and the column was accomplished by setting the beam on top of the column, out of which projected dowels which passed vertically through sleeves cast in the beam. These sleeves were large enough to be filled with grout after the beam was erected and leveled. The use of the cantilever beams allowed the use of a 12 inch column width, while the simple spans would have required either a greater width or a haunch at the top of the column. The greater width at the top of the column would be required to satisfy bearing conditions for two beams, plus an allowance for end anchorage of prestressing units between the beams.

Beam Bearing

The beam-bearing at the end of the cantilever was a simple bearing connection made by casting steel bearing plates in the ends of the beams. The beams were restrained laterally by the precast roof deck, which was tied to the beams with concrete cast between the deck units over the beams.

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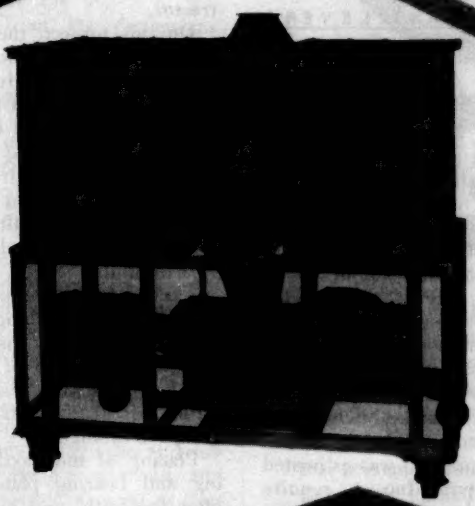

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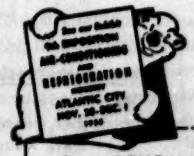

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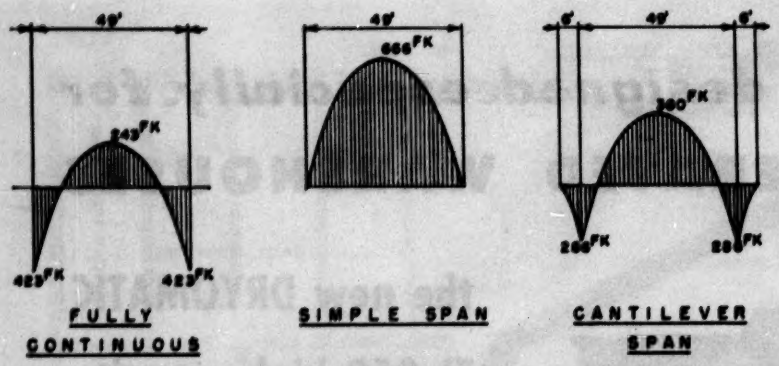

Fig. 3 — Moment diagrams of three beam types studied for construction of Ft. Worth plant, U. S. Cold Storage Corp.

Work By Specialists

For bidding purposes the center of gravity of the prestressing steel was indicated on the beam elevation, and the prestress load was given for each beam. The General Contractor received bids from several sub-contractors for furnishing the necessary prestressing steel, or furnishing and stressing the steel, or for furnishing a fabricated girder. The successful bidder, Texas Stressed Concrete Corporation, furnished, placed, and stressed the steel in the beams cast by the General Contractor. Thus a large portion of the risk to the General Contractor in bidding on work unfamiliar to him, was removed.

The girders were cast on the floor slab adjacent to the columns upon which they were finally set, using plywood forms built in panels which could readily be disassembled, and erected again at the next beam location. The beam side forms were removed 24 hours after the concrete was cast; using this procedure it was possible to cast the 140 beams with the use of nine sets of beam forms, thus getting about 16 uses from the forms.

Beam Design

The beam design called for the use of 5000-lb concrete, which strength was achieved by using ¾-in. crushed stone aggregate, with seven sacks of cement and with pozzolith admixture. There was much concern about placing the concrete in the beam forms through the narrow web, especially where the tubes for the wires bent up and nearly filled the web. With the use of the concrete mix mentioned, and with careful placing by the Contractor, using mechanical vibrators, no objectional honeycomb was found when the beams were erected exposing the soffits.

Erection of the beams was accomplished by the use of a 30-ton motor crane setting the beams on top of the columns with the dowels, cast in the column top, passing through vertical sleeves in the beam. Non-shrinking grout was used under the beam bearing at the column, and to fill the dowel sleeves through the beam. The erection of the ten ton beams was no more costly than would have been a steel girder of approximately the same span.

The general contract, which includes all work other than the insulation and refrigeration, was estimated by Thos. S. Byrne, Inc., to require 175 calendar days. This work was accomplished on schedule, allowing the contractor extensions in time for strikes, bad weather, and additions to the original contract.

The General Contractor has stated that this design made possible a schedule and sequence of operations, which when strictly adhered to, gave the Owner a usable structure much earlier than could be anticipated with the more common designs.

Pre-Stressing Selections

The drawings and specifications permitted the use of any acceptable method of prestressing, i.e., stranded cables, high strength alloy bars, or high tensile wire units. The details of placement, showing the physical dimensions to meet the required eccentricities of the units as shown on the plans, were to be submitted for approval by the prestressing subcontractor.

On this project, the High Tensile Wire Unit was the successful bidder. The amount of required initial prestressing force varied from 422 kips[1] on the longest beams to 218 kips on the shortest beams at the perimeter of the building. Required prestressing forces were provided by using ¼ inch wires with an ultimate strength of 240,000 psi assembled in 8 and 10 wire units.

The overall procedure was as follows: Place the tubing and bearing plates in the forms, cast the concrete, measure the length of openings, cut and head the wire, place the wire in tubing, stress the units, and pressure grout the tubing.

Placing of the flexible metal tubing and bearing plates was begun after the soffit, and bulk heads, one side of the beam form had been erected, and the mild steel and stirrups had been placed. A mild steel bar was placed inside the tubing to

[1]In steel construction indicated loads are expressed in kips. The term kip (abbreviated from kilo-pound) is used to designate 1,000 pounds. Here 422 kips is a terse and convenient method of expressing 422,000 pounds load.

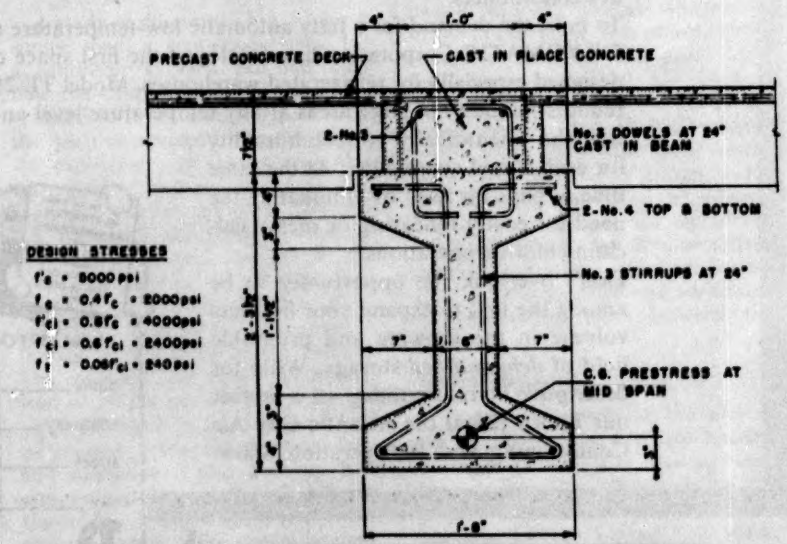

Fig. 4 — Beam section at mid span, the prestressed cantilever type selected for providing clear floor areas which resulted in five percent more revenue earning space.

keep it in the correct position during placing of concrete.

High Tensile Wire Field Cut

After the concrete had been cast, the exact length of the tubing in the beam was measured and the required number of wires were cut to length on a cutting bench. By measuring and cutting the wire units after the concrete was cast, it was not necessary to calculate the length of the curved units from the dimensions given on the plans. This also permitted changes in the length of beams in the field; gave accurate lengths of the parabola curves and the reverse curves which were required on the cantilever beam; and automatically made allowance for casting errors and shrinkage of the concrete before stressing age.

Since the type of connection between the cantilever and simple drop-in beams called for close tolerance in dimensions, it was also desirable to keep the protrusion of the prestressing units beyond the ends of the beams down to a minimum.

The wire units were then inserted into the proper tubing, the end anchoring hardware was attached, and stressing was started as soon as tests indicated the concrete had attained its required strength. Each beam had a minimum of three groups of wires and as many as six, arranged symmetrically on the end faces of the girders. In order to avoid undue bending and/or buckling stresses in the beams, a definite procedure had to be followed as to the order of stressing of each unit. The amount of prestressing force was determined primarily by calibrated gauges.

Cement and Sand Under Pressure

The final step was the injection of a cement and sand grout under pressure into the tubes to fill the voids between wires and tubing. The mix was approximately two to one of sand and cement. Enough water was added to give a thick paint consistency rather than a definite amount which would be subject to the water content of the sand on any given day. No admixtures were used, as experience has shown that none are necessary to do an excellent job of grouting. After the beams were erected, the joints between two beams in the case of cantilever beams, were filled with concrete. This served to cover the end anchorage hardware assemblies.

It is not desired to leave the impression that prestressed cantilever beams effect the most economical

(Continued on page 59)

UNITED BB CORKBOARD

FOR STRUCTURALLY SOUND LOW TEMPERATURE INSULATION

United's patented BB (block baked) Corkboard installs easier and stays on the job! High strength in relation to light weight permits a sturdy, self supporting structure that is simple to erect. United's corkboard is flexible; the big straight-edged slabs fit accurately and work as easily as lumber. Most important, there is adequate flexibility to conform to minor wall irregularities and absorb stresses. *You get a tight fit that stays tight . . .* that prevents creation of moisture-carrying channels which can eventually destroy the insulation value of your installation.

Yes, United BB Corkboard gives you truly time-tested insulation with a unique combination of benefits ideal for low temperature service.

- All cork construction without added fillers or binders.
- Extremely efficient heat insulator that retains initial low K factor when properly installed.
- No capillary attraction for moisture, hence doesn't rot, swell, warp or support bacterial growth.
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- Bonds tightly with cement, paint, hot or cold asphalt.

COMPLETE INSTALLATION SERVICE TOO!

Your nearby United Cork Companies branch office provides a *complete* corkboard service . . . *from product to final installation* . . . to meet your individual needs. Trained engineers are available for consultation . . . or will design every detail of your job. If you desire, our skilled work crews, supervised by the same engineers, will erect your installation. Almost half a century of service to the refrigeration industry assures the satisfactory performance of *your* BB Corkboard installation . . . today and for years to come.

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Manufacturers and erectors of cork insulation for almost a half century

Engineering and installation offices, or approved distributors, in key cities — coast to coast.

Annual ASRE Meeting Atlantic City Geared to Record Attendance December 1-3

THE 51st annual meeting of The American Society of Refrigerating Engineers will be held at the Traymore Hotel in Atlantic City, N. J., December 1-3. This is during the same week as the ARI-sponsored 9th Exposition of the Air Conditioning and Refrigeration Industry which is also being held in Atlantic City, Nov. 28 to Dec. 1.

According to advance registrations for both meetings a record attendance is expected. Almost 500 ASRE reservations alone have been received up until two months before the meeting. Many members who have not turned out to ASRE National Meetings in years have made reservations.

In addition to three technical sessions, the diversified technical program will include a packaged air conditioner conference, a dimestic refrigerator engineering conference, a conference on new fields for Mechanical cooling and six technical forums covering controversial and other timely subjects.

Program Committee Chairman, Everett P. Polmatier, Carrier Corp., has announced the following Tentative Program Schedule:

DECEMBER 1, THURSDAY A. M. —
FIRST TECHNICAL SESSION

"Heat Transfer at Simulated Altitudes", W. L. Holladay, Holladay & Westcott, Engineers, Los Angeles, Cal.

"Cascade Refrigeration Systems For Ultra Low Temperatures", D. J. Miserimer, Pacific Refrigeration Co., Los Angeles, Cal.

"Reactions in 'F-22' Systems", H. M. Elsey, Consulting Chemist, Westinghouse Research Laboratories.

DECEMBER 1, THURSDAY P. M.

Six technical forums: Sponsored by ASRE. General Technical Committee Chairman, John Engalitcheff, Jr. Will be completely off-the-record (members of the press will not be admitted) and unrecorded (let your hair down) open discussions.

1 — Defrosting of Low Temperature Evaporators
2 — "Freon" vs. Ammonia in Industrial Installations
3 — Economic Comparison between Wet and Dry Condensers
4 — Transportation Refrigerating Equipment
5 — How Can ASRE Help Promote Realistic Published Product Ratings?
6 — Contaminants in a Refrigeration System

DECEMBER 2, FRIDAY A. M.
— SECOND TECHNICAL SESSION

"Variation of Thermal Conductivity with Temperature of Insulating Powders", Peter E. Glaser, Arthur D. Little, Inc., Cambridge, Mass., and Carl F. Kayan, Head of Mechanical Engineering Dept., Columbia University, New York.

"A Field Evaluation of the Performance of Vapor-Vented Insulation in a Large Freezer Warehouse," Prof. E. R. McLaughlin and Prof. E. R. Queer, The Pennsylvania State University.

"It Pays to Provide Comfort Cooling for Hogs," Prof. W. E. Fontaine, Purdue University.

DECEMBER 2, FRIDAY A. M.

Domestic Refrigeration Engineering Conference. Chairman — F. L. Tarleton, Manager, Refrigeration Engineering, Hotpoint Co. Built-in Refrigerators and Freezers.

I — Introduction — Chairman F. L. Tarleton
II — Planning the Kitchen-Home Economist — Dr. Glenn H. Beyer
III — Designing Built-Ins — Industrial Designer
IV — Designing The Kitchen — Architect
V — Building the Kitchen — Builder
VI — Selling Built-Ins — Marketer

DECEMBER 2, FRIDAY P. M.

New Fields For Mechanical Cooling Conference — Chairman S. J. Williams, Jr., Whirlpool-Seeger Corp.

Introduction — Chairman — S. J. Williams, Jr.

"Temperature, Humidity and Air Motion Related to Human Comfort", Prof. M. K. Fahnestock, University of Illinois.

"Energy Exchange and Thermoregulation in Cattle and Man 50 to 105 F Ambient Temperateure", Dr. Samuel Brody, Dept. of Dairy Husbandry, University of Missouri.

"Effects of Climatic Environment on Swine", Dr. F. N. Andrews, Professor of Animal Husbandry, Purdue University.

"Effects of Environment on Chickens", Dr. W. O. Wilson, Dept. of Poultry Husbandry, University of California.

"Effects of Temperature and Humidity on Plants", Dr. H. A. Senn, Botany and Plant Pathology Div., Science Service, Dept. of Agriculture of Canada.

DECEMBER 3, SATURDAY A. M.

Third Technical Session

"Boiling Heat Transfer in Horizontal Tubes, Merl Baker, Assoc. Prof. of Mech. Eng., University of Kentucky.

"Determination of Boiling Point and Boiling Range of Refrigerants", W. H. Decker, L. B. Smith, A. D. Turissini, Research Laboratories, General Chemical Division, Allied Chemical & Dye Corp.

"Condensing Heat Transfer" — (ASRE Research Project #25), R. C. Potter, Kansas State University.

DECEMBER 3, SATURDAY A. M.

Air Conditioning Conference — Chairman, R. A. Gonzalez, Airtemp Div. Chrysler Corp. Room Air Conditioners.

I — Advertising and Rating
II — Aluminum Heat Exchangers
III — In-Wall Units
IV — Quiet Units

Entertainment

The host committee, under the chairmanship of Justin Neuhoff, General Electric Co., is going all out to give members and guests the very finest entertainment and social functions. These will include an outdoor ice skating party, an inspection trip to the Renault Winery, swimming in the Traymore's new indoor pool.

The Thursday Noon welcome luncheon will be addressed by Vice Admiral Earle W. Mills, U. S. Navy Ret., president of Foster-Wheeler Corp., president of Society of Naval Architects & Marine Engineers, and Former Chief of the Bureau of Ships. His subject will be "Atomic Energy."

The traditional ASRE cocktail party and dinner dance will be held Friday evening. Music for both will be furnished by Howard Lanin's famous band and there will be several professional acts and other entertainment.

One of the major attractions of the meeting will be the Research Exhibit which will present some 20 non-commercial displays of interesting and important developments in air conditioning and refrigeration.

Frozen Asparagus Pack

THE Frozen Asparagus pack this year was 25,318,619 pounds, according to a preliminary tabulation by the National Association of Frozen Food Packers. The 1955 total was not much different from last year's pack of 25,779,827 pounds, but was significantly smaller than the record output of 32,945,017 pounds in 1953.

Regional production followed somewhat divergent trends this year. In the East and South the pack declined about a million pounds, but this was partially made up by production increases in the Midwest and the West Coast. The increase in the West Coast pack was due to larger production in California.

Practical Refrigerating Engineer
NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Acid Chemistry for Refrigerating Engineers

FRANK J. VERSAGI
Sr. Analytical Chemist
Mueller Brass Co.
Port Huron, Mich.

Acid development in a fluorinated hydrocarbon refrigeration system is serious, but nevertheless of secondary importance to moisture. Without the presence of water, acid cannot develop in the system. Knowledge of simple acid chemistry and application of silica-gel driers with an acid indicator is good defense against machinery derangements. However, the best defense is to keep moisture out.

ENGINEERS who follow the trade papers have noticed that the scare campaign on acids is dying out, and that acid is once again assuming its relatively secondary position in the drier picture. The great acid campagn, many are convinced, was tremendously exaggerated. This contention is acceptable, if the refrigerating engineer keeps his eyes centered on the overall picture, rather than just a part of it.

During the period of acid emphasis, there was some intimation that silica gel does not remove acid. It is believed that a practical demonstration will bring out the efficiency of acid removal by silica gel.

For years, most of the industry felt certain that silica gel effectively removed moisture and acid from refrigeration systems. The removal of acid has always been considered secondary, because, *if no moisture is present, no acid can form.*

When the acid campaign really gained momentum, the analytical laboratory of Mueller Brass Co. was requested to develop a simple demonstration which would make clear the efficiency of silica gel. This audio-visual display was developed as shown in Fig. 1. However, a brief review of the mechanics of acid formation in a refrigeration unit are in order, before proceeding through an explanation of the demonstration.

Acid Formation in Systems

Normally, acid comes from two sources: (1) refrigerant breakdown; (2) oil breakdown. But — and this is very important — *both of these processes need water to produce acid.*

Paper and demonstration before the Michigan Chapter, *NAPRE*, June, 1955.

EXECUTIVE OFFICE NAPRE
433 N. Waller Ave.,
Chicago 44, Ill.
OFFICERS
President: Regis Gubser
Los Angeles, Calif.
Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

To demonstrate the formation of acid, observe three basic chemical formulas given in Fig. 2. First, (on the left) is the common refrigerant Dichlorodifluoromethane ("Freon-12", "Genetron-12") which is chemically CCl_2F_2. Then, at the right is water, normally written H_2O. For demonstration purposes we will use the formula HOH. Finally, at the bottom of the triangle, is the symbol for hydrochloric or muriatic acid, HCl.

Breakdown of Refrigerant Does Not Produce Acid

Theoretically, if this refrigerant were broken down, there would be obtained carbon, chlorine, and fluorine — but no hydrochloric acid, HCl. It is obvious that a simple breakdown of the refrigerant cannot produce acid.

However, if an H from HOH (water) joins the Cl of the refrigerant, then HCl is formed, — hydrochloric acid.

This is a simplified method of portraying the chemical reaction, but the point to keep in mind is that *the presence of water is required to form acid.*

Acid Formation From Oil

In oil breakdown the chemical reactions are more complex, but again the available hydrogen to form the acid can only come from moisture which must have previously entered the system.

Acid does not immediately form when water comes into contact with refrigerant or oil. This type of reaction proceeds slowly, sometimes taking days to actually produce a minute amount of acid. It is obvious, therefore, that if moisture is not allowed to build up in a system, or if it is removed soon after it has entered, there can be no acid formation.

The importance of moisture is further illustrated by the fact that, technically, HCl is a gas called hydrogen chloride. As long as this gas is perfectly dry it will not attack metal. As soon as it becomes moist or is dissolved in water, however, it forms hydrochloric acid which is the troublemaker.

Acid Removal from Systems

From this brief discussion on the mechanics of acid formation, it may be seen why acid is considered of secondary importance. All this is fine. But suppose acid does get into the system — how is it removed?

In the laboratory, the chemist almost always removes acid by neutralizing it — by making it react chemically with a standard caustic or alkaline substance. In order that he may know when all the acid has been neutralized, the chemist makes use of a second substance called an Indicator. This substance does exactly what its name implies — it indicates by a change in color whether a system is acid or acid free. The indicator Mueller is using today is colorless in an acid system and pink to red when all the acid has been neutralized.

Of course, in a refrigeration system the engineer can't conduct a controlled chemical neutralization. There he depends instead upon a good desiccant to physically adsorb the acid. The demonstration (Fig. 1) is designed to show that silica gel will remove acid just as thoroughly, just

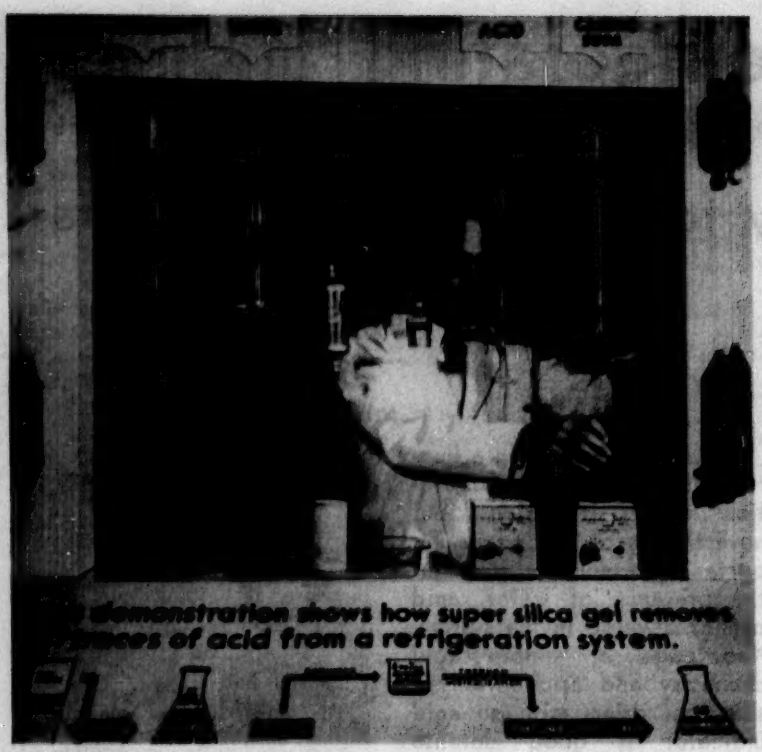


Fig. 1. Frank J. Versagi, Chemist, demonstrates acid removal from refrigerants by use of silica gel. The exhibition similated conditions within a refrigerating system.

as completely, as the most exacting laboratory neutralization.

Similates System Conditions

The demonstration consists of taking a portion of our refrigerant, and to this add water. The water in this case is merely to enable the indicator to function properly, since the indicator will not react in refrigerant alone. Add a few drops of indicator, insert a stirring bar, and place this sample under our caustic dispenser. Slowly, allow the caustic to drop into the solution (Fig. 1). There! — one or two drops of the caustic have turned the indicator pink, indicating that there is no acid in the pure refrigerant. The two drops were needed merely to enable the indicator to change color.

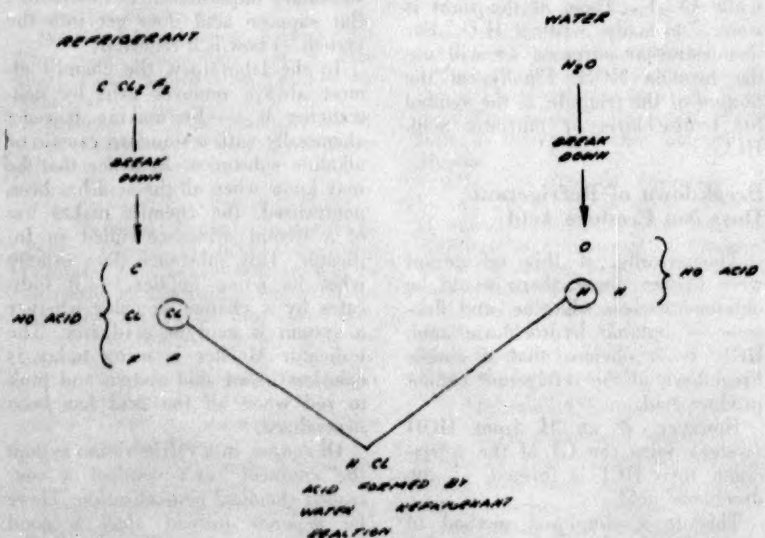


Fig. 2. Diagrammatic arrangement of chemical symbols for refrigerant and moisture in a refrigerating system. Union of certain molecules brought about by de-composition of the two, results in acid formation.

Duplicates Acid Behavior

Keeping this in mind, take a second portion of refrigerant and to this portion add 10 percent of its volume in acid. This is equivalent to 100,000 parts per million—far more than could ever be found in a refrigeration system unless the acid was added just as it was added here. Again, add water to enable the indicator to function properly. Insert the stirring bar, place it under the caustic dispenser, and allow the caustic to enter this sample.

Those first few drops turned the first sample solution pink. But acid was added to this simulated system (sample two), so it will take more caustic to neutralize it. From the level of the caustic falling from the tube, it will be observed that it took some six or seven divisions of caustic to neutralize the acid which had been added.*

Well, so far the demonstration is fine. But, as noted before, this sort of controlled neutralization can't be run on a refrigeration system. Therefore, engineers and owners must depend on the desiccant. Therefore, it must be determined if the desiccant will perform this service. To be convincing, the next step of the demonstration would be to try it on the drier contents.

Demonstrates Drier Action

Take the last portion of refrigerant. Again, add to it the 100,000 ppm of acid. Allow it to mix throughly. Remove the caps from a drier charged with silica gel. Pour this third sample mixture through the gel, catching what comes through.

To the sample solution caught, add water. Just as in the first two tests, insert stirring bar and add indicator. Slowly allow the caustic to enter this sample.

There! — One or two drops turned the indicator pink, just as in the case of the pure refrigerant which was brought directly to the caustic dispenser. All the acid which was added in sample three — 100,000 ppm — was completely adsorbed in one pass through the silica gel.

*So that observers could be sure that the demonstrator was working with acid, strong acid, some of it was allowed to come into contact with zinc. It immediately began to dissolve the metal.

From the President's Desk

Gubser Retires; Acknowledges Sources of Help

BEFORE the inauguration of our new president, I want to take advantage of this last message from my desk to thank all of the officers and committeemen for their wholehearted support and cooperation in making my term a pleasant and successful one.

Vice Presidents LeRoy Etzel and Bert C. McKenna were particularly active in following up on chapter activities, and Bert especially wrote many letters to members-at-large. Leland Kenagy, our faithful watchdog of the Treasury, did his usual efficient job of handling all our banking and financial details. In addition to his regular duties, Lee spent many hours in organization of the group in Kansas City. That potential chapter held their first meeting September 15, 1955 with 20 prospective members in attendance.

Our Sergeant-at-Arms, John N. Mariakis, was very active in assisting in getting in the dues from many chapters who were a little late in their spring collections. Directors Hubert Branham, William R. Burnett, Roy T. Burns, Frank L. Chase, and Tom Weatherford, Jr., under chairman R. A. O'Neill, were particularly helpful to the chapters in their respective areas by constantly corresponding with them. They offered advice and encouragement to the officers in the chapters when it was needed most.

Commends Education Leaders

I feel most indebted to, and all our members should be delighted with the performance of the Educational Committee. The chairman, Prof. Harold P. Hayes, did a most outstanding job of handling the Question Box in our journal INDUSTRIAL REFRIGERATION. Vice-chairman Guy R. King, the author of our official text has done a yeoman's job of preparing the first half dozen chapters of the Instructor's Manuals for the use of the Chapters in their educational classes. All the other members of this committee were very helpful whenever they were called upon.

The Publication Committee, the workhorses of our association (all diligent workers too numerous to mention here) under their long-time chairman, Erick B. Utescher, did a most outstanding job this year in getting in so many items for our *Operating Data Book*.

The membership committee under William S. Orton was very helpful in making our membership drives successful. Those whose names appeared most on correspondence which crossed my desk were S. Milton Rambo, Francis A. Yost, John T. Dabbs, Dean Emerson, Mort E. Bell, Allan W. Cox, and Falconer Anderson.

S. Averell Cole, chairman of our Public Relations Committee, was very successful this year in contacts he made with other organizations, especially the National Association of Refrigerated Warehouses. His co-workers assisted him in spreading the good will of our association far and wide. One of his members, Larry Benedict, deserves a special mention for his work in preparing and dispatching of the film of the New Orleans Convention to all the chapters.

Memorial Fund Group Cited

Another committee which has been little heard of as yet, but which will report at the convention, is the Venemann Memorial Educational Fund Committee, consisting of Angus M. Casberg, Ken M. Holaday, Louis P. Mantz, E. T. Quinn, Howard H. Peterson, and A. E. Wegener. These men have worked very diligently to prepare an educational loan plan to present to the membership. Although present policy of this committee is not to disclose amounts of contributions, nor associate the size of a gift to the fund with names of contributors, it should be stated for the record that Chicago Chapter has made the largest contribution yet received from chapters.

Last, but not least, I want to take this opportunity to thank, and express my indebtedness to our Secretary, J. Richard Kelahan and his assistant, Mrs. Gladys F. Fitch. I assure each of you if it had not been for their patience, understanding and most diligent work, I would have had a most difficult and unpleasant term. If employees of many operating companies were as diligent, hardworking, and faithful to their duty as these two, company officials would be more than pleased and stockholders would be most happy.

Objectives, which as President I have had an apportunity to inaugurate, but have not been accomplished this year and would like to pass on to the incoming administration, are:

Regis Gubser

First, completion and functioning of the Venemann's Memorial Fund; Second, the granting of Charters to the five or six cities who are now working toward that end, Third: a balanced budget.

Thanks of the National Officers, and myself especially, goes to the Los Angeles Chapter for undertaking the 46th Annual Convention. Again, space is too limited to mention everyone having responsible assignments. With apologies to my other colleagues for the space inadequacies, I will take note of the efforts of our national past president, Emmett T. Quinn, whose counsel and hard hitting salesmanship contributes much not only to the success of their venture, but also my term in office.

Report of the Month

Honors for the best report of the month with this issue, go to Rio Grande Valley Chapter. This distinction is not based entirely on Armin Doneis' description of topics covered, but also on his relaying of some very fine material for the Question Box. His report indicates an understanding of the purposes behind this monthly chore required of all chapters.

Competing for chapter report honors next year will be five new units. Denver, Sioux City and Tampa already have their petition in the hands of our Board. Kansas City and Las Vegas have delegations bringing theirs in. Officers of Denver, Sioux City and Tampa are respectively: Mike Bistranin, president; Marcus Florida, Secretary; Gerald E. Willson, president; Wm. T. Miller, Secretary; C. Scott Johnson, president; Frank F. Guida, Secretary.

Regis Gubser

NAPRE Meets In 46th Convention

AN EVEN dozen engineering events highlighted the educational program of the 46th Annual Convention of the National Association Practical Refrigerating Engineers in Los Angeles, November 7 to 10. Again, for the third consecutive year, there was a commercial exhibition in connection with the annual meeting.

Following the precedent established with the Purdue convention, NAPRE's board of directors, national committees and past presidents met on the day preceeding the official convention opening. This meeting, Monday, November 7, was open to all members, and at this session the association's activities and education, membership, publications and public relations were reported on, and policies formulated for the following term. President Regis Gubser scheduled this meeting to open with a luncheon at the Ambassador at noon. Chairman of the board, R. A. O'Neill, presided.

During the business sessions, delegates heard a report from the Venemann Memorial Fund committee. A program for the administration of this educational loan fund was presented for acceptance. This fund, established last year, has received many notable contributions. The association expects to put the fund to use in the term 1956-57.

Engineering Sessions Described

Convention activities commenced on Tuesday, November 8, with registration and opening of the exhibit hall. Following an invocation at 9:00 am., the association plunged into its engineering session with two talks. Automatic Ice plants was the first topic, followed by a report on U.S. Navy Refrigerated Cargo Ships.

Automatic ice plants discussed methods Pacific Fruit Express has employed in the application of automatic controls to various operations and equipment in their plants, as well as the complete automation of the new ice plant at Laramie, Wyoming and conversion to automatic operation of plants in North Platte, Nebraska, Los Angeles and Roseville, California. Diagrams of the wiring were presented and photographs of the actual installations illustrated the methods used.

Guy R. King
Educational Vice-Chairman

Robert F. McKee, a member of California No. 1, NAPRE, was the speaker on the automatic topic. He graduated from the University of California, Mechanical Engineering, in 1940. In World War II, he served in the U.S. Air Force, as pilot. Three years of that experience was with Air Material Command doing development work and test flying.

He joined Pacific Fruit Express Company upon release from military service in April 1946. As their mechanical engineer, he participated in PFE's post-war modernization and expansion program in which major changes have been made to almost every plant in the PFE system.

Sea-Going Cold Storages

The technical paper on Naval vessels covered the various design requirements, and detail descriptions of both design and installation of equipment and cold storage compartments on the refrigerated cargo vessels, Rigel and Vega. These ships were designed and built by the Ingalls Shipbuilding Corporation, Pascagoula, Mississippi, and are the largest refrigerated carriers built from the keel up.

F. W. Pardoe, speaker on this subject, is the chief ventilation, heating and refrigeration engineer at Ingalls Shipbuilding Corporation, Pascagoula, Miss. Mr. Pardoe has been with Gibbs and Cox, Naval Architect, and George G. Sharp, Naval Architect, New York City. While with George G. Sharp he was assigned to Ingalls to co-ordinate design with the construction activities during World War II. After the war, he remained with Ingalls and assumed his present position.

Air Conditioning Systems For Public Buildings

Afternoon sessions Tuesday opened with Larry P. Quinlivan as the speaker, who presented a paper on air conditioning of public buildings. He has wide experience in air conditioning and refrigeration applications. Mr. Quinlivan, who is a registered professional engineer in the state of Ohio, has been associated with York Corp. since finishing his post-graduate course at the Case Institute of Technology in Cleveland in 1934. He obtained his degree at Case the previous year.

Since 1934, Mr. Quinlivan has held various positions with York and has been responsible for the development of many types of refrigeration applications. In addition to his air conditioning experience, he has contributed to the solution of such problems as the development of ultra low temperature applications for wind tunnels, altitude chambers and test rooms . . . in which his company has pioneered.

Headline Speakers on 46th Annual Convention Program

Robbins *Davis* *Pardoe* *Kogan* *McKee* *Quinlivan*

At the present time, Quinlivan is Manager, Air Conditioning Sales, York Corp. and discussed the specific application of air conditioning to public buildings. Included in his talk was an analysis of multi-story buildings and the problems encountered in designing air conditioning systems for them. Factors influencing the design of an efficient and economical air conditioning such as — size and type of rooms, number of rooms, occupancy, interior areas, court ways and exposure were discussed.

Following Quinlivan, the delegates heard a discussion of modern refrigeration in the fishing industry by Ralph E. Manns, Los Angeles. On Dry Milk Processing By Low Temperature Refrigerant, George Armerding of Mojonnier Bros., Chicago, discussed the latest application of refrigeration equipment in a modern milk process at a plant.

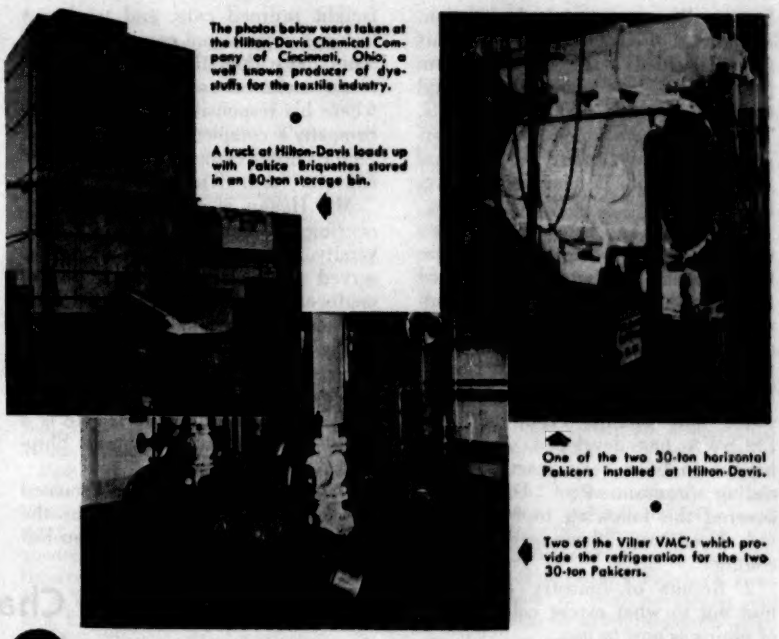
Refrigeration Bureau On Operating Costs

A long established precedent of NAPRE was the opening evening session of the Bureau of Refrigeration Information. The principal topic of the Bureau at this year's convention was "How to Reduce Operating Costs." Frank Elliot of Union Ice Company, Los Angeles, served as the moderator. Lester G. Winkler, Oshkosh Brewing Company, Oshkosh, Wisc., handled the topic of power costs. Frank L. Chase, Hibernia Bank Building, New Orleans, La., discussed operational savings. Labor costs were assigned to S. Milton Rambo, Consumers Packing Company, Lancaster, Penna. Miscellaneous and special cost savings were handled by Mort E. Bell, Sicks Enterprises, Seattle.

NAPRE's assistant educational chairman, Guy R. King, was the lead-off speaker at the Wednesday session. Mr. King, author of "Basic Refrigeration" discussed basic heat transfer principles as applied to the refrigeration and air conditioning industry. He was followed by Professor R. W. Davis of Union Ice Company, representing the NARW Safety Committee.

Since graduation from college, Mr. Davis has spent his entire time in the refrigeration field — last 23 years with the ice and cold storage industry (over 20 years with Union Ice Co.). During the last year and a half he has acted as safety director for Union Ice Co., in addition to present capacity of Superintendent of Branches.

About a year and a half ago he was elected president of the Safety Council of the Pacific States Cold



The photos below were taken at the Hilton-Davis Chemical Company of Cincinnati, Ohio, a well known producer of dyestuffs for the textile industry.

A truck at Hilton-Davis loads up with Pakice Briquettes stored in an 80-ton storage bin.

One of the two 30-ton horizontal Pakicers installed at Hilton-Davis.

Two of the Vilter VMC's which provide the refrigeration for the two 30-ton Pakicers.

Q. What is the most economical way to cool dyes in a chemical plant?

A. Use Vilter REFRIGERATION that costs less to own*

In the production of dyestuffs, much unwanted heat is generated. One of the most practical methods for removing this heat is to use ice, both directly and in latent heat storage. For many years the Hilton-Davis Chemical Company purchased large quantities of expensive block ice for this job. Then Vilter field personnel proved the superiority of freezing and using Vilter Pakice Briquettes.

With Vilter Pakice equipment in the chemical as well as other industries, you can manufacture your own ice and save as much as 50% over other methods. In cases other than solution cooling, where air or product cooling is desirable or necessary, Pakice Briquettes also find favor. These hard, cold Briquettes, scientifically designed for minimum contact, pack closely, yet allow free passage of air over their surface. Actual tests prove that Pakice Briquettes cool to lower temperatures faster.

The source of refrigeration for the Pakicer are Vilter VMC ammonia compressors designed for a long life and trouble-free operation. Investigate Vilter's refrigeration and special heat exchanger experience to help you with your refrigeration problems.

Sold and Installed by Vilter Distributor, C. P. Wood and Company, Cincinnati, Ohio.

* Savings in low first cost are not the complete answer when considering the installation of refrigeration equipment. But savings in terms of years of extra service, reliable performance and minimum maintenance—that's where Vilter excels in low-cost ownership.

QUALITY CRAFTSMANSHIP that lasts . . .

ENGINEERING DESIGN that guarantees performance

Vilter REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Bunddel Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

Storage Warehousemen's Association. As part of their safety program this group decided to set up a uniform program of color coding of piping and conduit in ice and cold storage plants. This has been adopted by above organization and also by the National Association of Refrigerated Warehousemen.

Much time and research went into the formulation of the program. Davis' group contacted and secured information from American Standards Assn., American Society of Mechanical Engineers, etc., also duPont, Pittsburgh Paint, Sherwin-Williams, Fuller Paint Co., the eleven western states and others. From all this, PSCSWA has developed what they believe to be a very practical color coding program. Prof. Davis' talk covered the following topics:

1. Need and advantages of color coding.
2. Results of industry survey to find out to what extent color coding of piping is now in use.
3. How personnel reacts to various colors, and color associations.
4. Developing a uniform, practical and easily remembered color code for the refrigeration industry.
5. Outlining the code, display of color charts, "How to do it" drawings and instructions; other materials needed to color code a plant.

Entire talk will be illustrated with colored slides.

Corrosion and Railroad Topics

As previously reported, Wednesday afternoon was a "rope yarn" Sunday, providing delegates with an opportunity to inspect plants of their choice or participate in a golf tournament.

Lead-off speaker on Thursday was NAPRE's educational chairman, Dean Harold P. Hayes, California Polytechnic College whose subject was "Corrosion and protective coatings for the industrial refrigeration field." He was followed by Frank J. Hibbs, Jr., lined new developments and use of ice for vacuum cooling.

Engineering Sessions wound up Thursday afternoon with a mechanically refrigerated railroad car topic and a talk on new construction techniques for the brewing industry. First speaker was Laurence F. Hogan, sales manager of Carrier Corporation for transportation equipment, who has many years of experience in air conditioning and refrigeration systems for this field.

Prior to attaining his present position, he was active in design and production of cooling equipment for airplanes, busses, passenger and freight railroad cars, and trucks. A licensed professional engineer, he also spent more than three years in Carrier's technical service department where his responsibilities covered the company's complete line of "Freon" reciprocating compressors ranging in capacity from 3 to 125 horsepower.

Mr. Hogan is a mechanical engineering graduate of Syracuse University. Before joining Carrier, he served for seven years as a project engineer specializing in internal combustion engines and related reciprocating units with a manufacturer of air cooled motors. Mr. Hogan was an engineering officer with the U.S. Navy during World War II. He is a member of the Atlantic States Shippers Advisory Board.

Donald T. Robbins, who discussed new construction techniques in the brewing industry, is Chief Design Engineer, Holmes & Narver, Inc., Los Angeles, California. A Mechanical Engineering Graduate of Stanford University in 1919, he was for five years sales engineer in the Middle West for heating and ventilating equipment. From 1924 to 1944 he was Chief Mechanical Engineer for consulting engineering firms, joining Holmes and Narver, Inc., in 1937. Since 1944, in the positions of Chief Engineer and Chief Design Engineer, he has been responsible for all phases of engineering and architecture of a large volume of varied construction projects.

The complete report of the 46th Annual Meeting of the National Association Practical Refrigerating Engineers will be published in the December issue.

News Notes and Chapter Activities

Milwaukee

"Andy" Anderson

MILWAUKEE overlooked a few reports since May, but the Chapter was far from inactive. We invite the "recessing" cousins to look over our summertime activities. The Milwaukee Chapter held their June meeting at the Milwaukee School of Engineering. The educational session reviewed chapters 3 and 4 of the text. Vincent Noll was the instructor.

The chapter did not convene for a regular meeting on July 27. They met at the main office of the Schlitz Brewing Co. and were conducted on a tour of the power plant and engine room. Refreshments were served. Among many of the items capturing members' interest was an ammonia centrifugal booster compressor rated at 1200 tons, but said to be handling 1400 tons under application conditions. Another item under construction, and about which the description was a bit vague, was the new CO_2 collection and liquefying system. Somehow we got the idea that liquid oxygen is used in one of the scrubbers, but the IR reporter present couldn't get any additional comments. Apparently the project is still "classified".

The Milwaukee chapter did recess for August, but held their September 28 meeting at the Milwaukee School of Engineering. For the educational session, John Alberte was the instructor. A basic review of the values of insulation was covered. Principal item of business was the election of officers: President Pat Kelly, Vice-president John Alberte, Secretary Leland Anderson, and all Directors were returned to office. "Bud" Tondreau was elected treasurer, and Dick Graves became Sgt.-at-Arms.

A motion was made and passed that the chapter send a gift of appreciation to our instructor, Vincent Noll, who is very ill. A film on American industrial progress was shown through the courtesy of the Kelvinator Division of American Motors. The film depicted the rapid development of our country in industry, agriculture and domestic life. J. Richard Kelahan, National Secretary, gave a talk on the convention to be held November 8, 9 and 10 in Los Angeles.

Green Bay

Jim Schouten

AT OUR first fall meeting, September 21, President Bodart took up some correspondence from the national officers which was received during the summer and which needed immediate attention. This concerned the appointment of a member of our chapter to serve on the National Educational Committee. The president called for volunteers after explaining the duties and requirements of the appointment. Eugene Bruggink volunteered to take over this work. The treasurer read two new applications for membership and President Bodart welcomed the men into the organization. The Program Committee presented Mr. Maki of Standard Oil Company who gave a fine talk on lubricants as they are applied in the refrigeration industry. He also answered questions from the floor at the conclusion of his talk.

Leo Kusch informed the group that he had received requests from some members of the Fire Department rescue squad asking how they could become better informed on what to do in handling refrigerating equipment in case of an emergency. After some discussion and suggestions, it was motioned by Winkler and seconded that we invite the rescue squad representatives of Green Bay and any surrounding community to the October meeting. Our program would deal specifically with refrigerants and ammonia in particular, at that meeting. At this point Chairman Wishart of the Program Committee asked for further suggestions on a vacancy in the program.

Los Angeles
FRED HERR

GEORGE PAULICK, chief engineer, California Consumers Corp., presented a program on corrosion as the feature of the educational session, Oct. 5. The program was offered in two parts: a prefatory talk on the basic causes of corrosion and metals in industry in general; and methods of corrosion control in refrigeration and ice plants.

His commentary dealt with what he referred to as a "six billion dollar annual national headache—corrosion," which he

Entertainers plus perfect were Ted Huggins, Lecturer, June Lynn, musician, and Ed L. Nelson, Native Arabian prince, at the California No. 2 annual Go-Getters' Night.

tied in with a film, "Corrosion in Action", an International Nickel Company production, which followed his talk. Mr. Paulick explained that the magnitude of the subject made it necessary to confine his remarks to a mere skeleton outline, and that the subject would be treated in detail at the third day's engineering session of the national NAPRE convention in the Ambassador Hotel on November 10 in a paper on "Corrosion and Protective Coatings" by Harold P. Hayes, Dean of Engineering, California Polytechnic College. Corrosion, Mr. Paulick said, is the cause that deteriorates metals and tears down the machines that we are required to operate efficiently.

Chapter President Elmer A. Johnson presided over the business session. Among the guests was James J. O'Connor of New York, managing editor of "Power", a McGraw-Hill Publication, who attended to hear the discussion on corrosion. Mr. O'Connor was on a month's tour of the Pacific Coast which included visits to Los Angeles, San Francisco, Seattle, Portland and intermediate points. Reports on the progress of convention arrangements were given by Johnson, Regis, Gubser and Larry Benedict, and advance copies of the printed convention program were distributed.

Rudi Kettler announced a deep sea fishing trip to the waters off San Felipe, Ensenada, Mexico, the home of Yellowtail and Wahoo. The *S.S. Albacore* was scheduled to take off from Los Angeles Harbor on October 10 with Kettler, Herbert N. Royden, Jim Delore, Ray Smith and Charles Dacey aboard.

The meeting on Sept. 14 which officially opened the chapter's fall program, was in the form of the annual Ham-and-Beans dinner, preceded by a social hour, and followed by "Go-Getters Night" membership activity conducted by Frank Muzzy. There were 132 members in attendance with guests.

Membership drive activity of the summer months came to a head at this meeting when prizes were awarded to the leaders in the various membership classifications. Larry Benedict, who signed up 10 new members, was the sweepstakes winner. Others who brought in new members were:

Old Timers' Classification: Don H. Byl, 5; E. T. Quinn, 4; and Frank R. Elliott, Herbert N. Royden and Ray Burnett, 1 each. In-Between Classification: Mike Julius, 6; Flavil C. Register, 4; Elmer Johnson and Herbert E. Gerfen, 2 each. Amateur Classification: H. Takusagwa, 3; Mel Snyder, 2; Felix Powers and Ralph Manns, 1 each.

Membership applications were received at the September meeting from the following: John F. Brancheau, Frank W. Brennan, Walter R. Moffitt, Robert B. Montine, Henry O. Scott, Galen Van Dyke, Howard C. Jones, William J. McCarthy, N. B. Bradley, J. H. Bumpus, F. E. Meredith, Elmer Z. Backes, Alex B. Garcias, Sr., Floyd S. Baumer, Charles W. Lefler, A. H. Wintrode, Clovis D. Mead, Alan K. Ross, and James H. Stellar.

Speaker and guest of honor for the social was Ted Huggins, Public Relations Dept., Standard Oil Co. of Calif., San Francisco. The transformation of a country of veiled women, camel-back transportation, mule-powered irrigation, and sand-duned wastes into the world's rich-

National Director Wm. Ray Burnett seriously pleads his request for a favorite number, while National President Regis Gubser smiles for the cameraman's birdie. Scene was the Los Angeles Chapter fall social.

est producing oil region — where schools are going up by the scores as fast as they can be built, freeways are being laid, a building boom is in progress, where microwave communications and radio are no longer unknown— was the story presented in 3D color by Ted Huggins.

To contribute the third dimension to the program, Shiek Ed. L. Nelson, Union Ice Co., the Chapter's own native prince of performers and entertainers, invested himself in Huggins' Arabian robe. Members found it difficult to decide who should be honored as star performer, Nelson, Huggins, or Miss June Lynn, the Chapter's accordionist.

Memphis
CHAS. CONLEY

THIRTY enthusiastic members attended the meeting on September 7. There was a general discussion on the educational program for the term of 1955-1956; ways and means were discussed as to how the program would be conducted and carried on. Many expressed themselves as wanting to take the examination to get a certificate. H. L. Todd will continue as instructor for the group. Two new members were elected to membership; Douglas M. Platt, chief engineer, Claridge Hotel; and, Clifford W. Graves, maintenance engineer, Nate-Buring Packing Co.

On September 21, H. L. Todd reviewed Chapter No. 1 of Guy King course. This dealt with fundamentals. He demonstrated and illustrated points in the text with the use of thermometers, test tubes, dry ice, water ice and various materials. It put over the subject and brought out a lot of questions from those present. This was the first educational meet for the 1955-1956 term. The Chapter had been given some publicity in local newspapers and it brought out 40 who attended the meeting. Publicity created a lot of interest in the organization. Six new members were elected to membership.

Tacoma
PHIL GILMORE

IT IS with considerable sorrow, that the chapter reports the passing of its secretary-treasurer, C. W. E. "Elmer" Johnson. Appointed to fill this vacancy until the next regular election of the chapter is Phil Gilmore, it was announced by John Moyer, chapter president.

C. W. E. "Elmer" Johnson

Elmer Johnson passed away September 7, 1955 in a Tacoma hospital. He was born in St. Paul, Minn., in 1889 and had resided in Washington the last 36 years. He is survived by his wife Celia Johnson, two sons, a daughter and six grandchildren.

Mr. Johnson was chief engineer for the Tacoma Ice Co., 26 years, having formerly been with the Rainier Ice Co., in Seattle. He was extremely active in the NAPRE, being a charter member of Tacoma Washington Chapter No. 2 and held the office of Secretary-treasurer practically since its inception. He was a delegate to several National NAPRE conventions and was widely known and liked nationally and locally. He was also a member of the Fraternal Order of Eagles and Local 606, International Union of Operating Engineers, AFL.

Tampa
MARTIN SMITH

TAMPA Chapter commenced operations in earnest on September 15 and October 6. Pro-tem officers elected are C. Scott Johnson, president and Frank F. Guida, secy-treas. Our petition for charter is submitted and we look for announcement of its award to us by NAPRE's Board of Directors, following the November convention.

We feel fortunate in the officers elected

and in the cooperation of management, labor and education organizations with this movement. C. S. Johnson, our president pro-tem travels the entire state and part of the islands in a supervisory and erecting capacity. His educational background is such that he probably could teach refrigeration in any university. He attended Rose Polytech in Indiana and The University of Illinois in Urbana.

Acting secy.-treas., Frank Guida, is in business for himself and services quite a number of plants in this area. He is most familiar with the practical aspects of refrigeration. Most of us who signed the application for charter have been active in the labor movement for some years and have seen many an organization come and go because of poor administration personnel, so we purposely stalled until we could get what we thought were the proper men for officers.

Mr. Womack, business representative of the Operating Engineers Local and Ted Davis of the Plumbers Union will assist us in any way possible. Member-at-large, William W. Johnson, attended our first meeting and expressed his desire to affiliate with us in the chapter. At present he is employed by Ocean Products, Hookers Point, Tampa. The York sales representative in this area has also extended a helping hand and Mr. Barritt, manager of Borden's Dairy has provided the chapter with a meeting hall at their place, 3319 Florida Avenue. Both the Plumbers organization and the local brewery offered us meeting places, but the facilities at Borden's seemed to suit our purpose for the present.

It is suggested that the national office inform Denver, Sioux City and Kansas City that we are right in there pitching for those contest gavels, too. President C. Scott Johnson has already anticipated the feel of one of them in his hand.

Denver

MARCUS FLORIDA

FIRST meeting at Denver held on the first of October appears to pro-tem officers of the Chapter as a big success. This makes it "official". Denver is petitioning the Board of Directors for a charter to be awarded at the November Convention. Presentation date and installation of our first officers will be announced later. Mike Bistranin, our "photographer", serves notice on NAPRE President Gubser, to reserve one of those contest gavels for Denver.

Engineers attending our first meeting were: Harold Andre, J. Arnold, Paul C. Barringer, Charles A. Beals, Ray Bell, William Bistranin, Elmer M. Woulwan, W. L. Bramkamp, Maurice Bryan, Ed F. Cameron, Walter Carbaugh, J. Michael Carney, Ralph M. Cox, Troy Croniger, Kenneth Doyle, E. O. Edlund, Lee Emerson, J. Bruce Espy, Adrin F. Ferdig, Clarence W. Fleming, E. A. Froese, Maurice M. Fouk, E. C. Francon, J. R. Ferguson, Arthur Georgeson, Lupe Gonzales, Robert G. Hall, J. T. Harty, Ace Hays, Raymond J. Hertz, Kenneth G. Hess, Chet Hesterwurth, E. W. Irwin, William J. Joslin, Tony Jurado, Ben Kock, Roy H. Koogle, O. B. Martin, Jerry McCoy, Jack McCutchen, W. C. Murphy, W. M. Oblak, Thomas L. O'Leary, Fay R. Pearson, Norman G. Phipps, William Rhanyay, John W. Richmond, John Rohrs, Harry M. Rose, Delmar Seward, William Spadi, F. J. Staats, Edmund C. Zinns.

Also present from Safeway were Mike Bistranin, Roger Caldwell, O. A. Hamm, Henry Barrie, George Carlyle, Carl Beiswanger, Mort Heathman and Marcus Florida.

Plants represented were Safeway, Arvada Packing, Capitol Packing, Coors, Farmount Foods, Denver Club Building, Denver Dry Goods, National Foods, Pepper Packing, City Ice, York Corporation, Swift, Continental Baking, Rocky Mountain York, Air Engineering, Inc., Rocky Mountain Dairy, Cudahy Packing, Tivoli, Litvah Packing and Colorado Ice and Cold Storage.

It seems that NAPRE is just what most of the engineers in Denver are looking for. The Chief Engineers of most plants are really interested in the educational angle. There are practically no apprentice programs in any plants in town so we can meet part of the need here with NAPRE.

Detroit

LEON ADAMS

DETROIT is now getting ready for our new season. Something new has been added. Our Chapter has announced new refrigeration study classes, which will be held on the second Friday of every month at the Wilbur Wright Vocational High School. Our regular monthly meetings will be in addition to the classes.

The first class will be conducted on Friday, November 14, 1955, and the instructor for this first night will be Carl A. Turnquist, Refrigeration Instructor of Cass Technical High School. His opening topic will be "Basic Refrigeration". Our Educational Committee will conduct the classes after that, dividing the night between themselves. The NAPRE course will be followed basically along with suggested educational procedure contained in the Manual sent from Headquarters.

Views of the first Denver meeting held at the Safeway warehouse lunchroom.

Colton

HARRY BONTER

OUR September 14th meeting was suspended for the picnic held instead at Devil's Canyon, north of San Bernardino. Members attending enjoyed the warm comfortable evening under the pine trees and the aroma of Chef Carl Hooker's hamburgers on the grill just made every one hungry. The members, friends, wives and children surely had a good time eating

Activity at Colton's fall barbecue: L to R, J. E. Finfrock (dark shirt); Alvie Miller, wife and children seated; Harry Bonter (white shirt) and Mrs. C. H. Purkiss, foreground. Second and third on right are Mr. & Mrs. A. W. Franklin, with T. C. Bangs fourth, all seated. A. S. Chantry and family in center background.

at the long tables loaded with food and drinks. Some were late arriving for dinner, lost their way driving to the canyon. J. E. Finfrock, Assistant Chef and Carl did a fine job on the hamburgers. C. H. Purkiss got the photo.

Rio Grande Valley

ARMIN DONEIS

DISCUSSION of compressor drives at the meetings of September 20 and October 4, followed the outline in Guy King's refrigeration course. The relative merits of the various types of single-phase and polyphase motors were compared. Operation and maintenance of synchronous motors and their auxiliary equipment like switchgear and exciters were discussed at length and the matter of brush setting, sanding and maintenance came in for considerable attention. Some of the finer points of commutation were brought up and the importance of equally spacing brushes around the commutator circumference was stressed with a detailed description of the use of a paper strip and a sharp pencil method in connection with dividers.

The turnout for the past two meetings has been encouraging, members and visitors in attendance being the best since our chapter resumed operations this Fall. Armin Doneis is still pinch-hitting in the absence of a better instructor and the membership is loyally standing by him with forebearance and encouragement.

On September 20, in the absence of vice-president Rube Keener, who has now taken over the presiding of meetings since transfer of Dan Chapman to the territory of the Coastal Bend Chapter, A. M. Casberg presided over the meeting. Distribution of Operating Data Books preceded, and Mr. Casberg made a large number of visitors welcome and introduced them to the activities and proceedings of NAPRE

with a description of the Rio Grande Valley Chapter's work and pleasure. Literature was distributed to help acquaint the visitors with the good work of NAPRE on a local and a national level.

On October 4, President Rube Keener expressed his delight over the good attendance and presence of a large number of visitors also. Minutes were read and approved, and during roll-call the Operating Data Book of 1955 was distributed to paid-up members. Sample copies of last year's book were distributed among visitors and these were gladly accepted.

Members-at-Large

BERT C. MCKENNA

WITH this month's report, it is the writer's final opportunity to give the members of the association information of the doings of our members-at-large. It is not that the column will be discontinued, but rather the conclusion of the writer's term in office. It is sincerely hoped that the readers will pardon the deviation, but this seems to be the only opportunity to thank the members-at-large for their information and cooperation with the 2nd vice-president during the past term of office. Although there has been little opportunity to do so in person, it is believed that this column has gotten more of us acquainted.

Very probably in the past year, a great many of our members-at-large have not seen their names appear in this column. It is regretted that this was not possible, nor was it always possible to relate the activities of the members-at-large promptly. Information passes through many hands before it reaches this column. It all involves time, which accounts for our mentioning some of the following members-at-large so late in the season. Our national office has received correspondence from A. J. Chadima of Cedar Rapids, Iowa, among some of the correspondence from our members in the tall corn state. We also learned recently that Blanchard L. Sprunger has made a change of his employment from Lafayette, Indiana to Urbana, Illinois. Although his correspondence did not indicate what his new position may be, NAPRE members wish Mr. Sprunger the best.

Also in Illinois we heard from those two members at Beardstown: John H. Glenn, owner, and George W. Large, engineer, of Glenn Ice and Fuel Co. Heading back west, geographically speaking, we also heard from Donald E. Shuffler, Council Bluffs, Iowa; Cash Moraczewski, North Platte, Nebr.; Kester D. Johnson, Superior, Nebr.

In the great Southwest, some of the members corresponding have been C. W. Harnist, Fort Worth; Carl Nessler, Jr., Texas City; Larry W. Banta, LaPorte; William W. Roberds, Houston, and Joe LeRoy Henry, Pasadena, Texas; T. V. Woodward, Anadarko, Okla.; E. A. Tipton, Lubbock, Texas and S. G. Galvan, Crystal City, Texas.

(Continued on page 60)

NAPRE

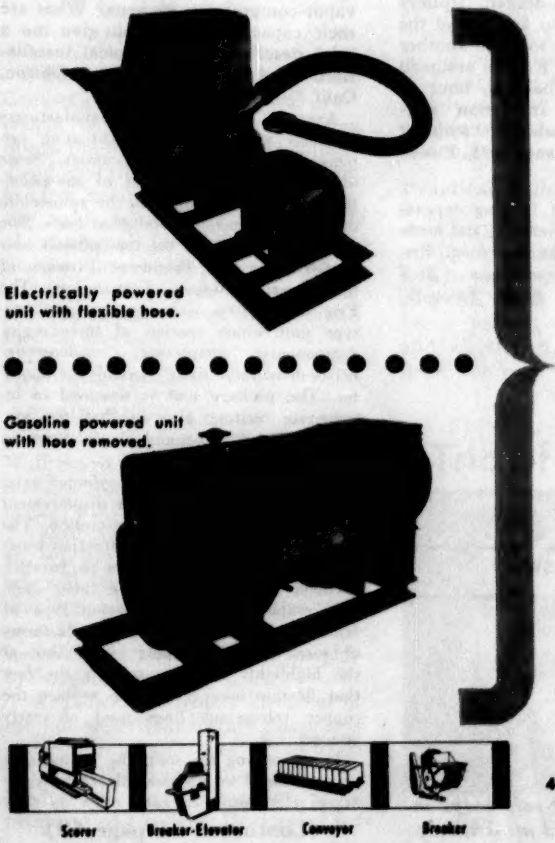
Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

Church Air Cooling Problem

QUESTION NO. 1074: We plan to air cool our church. It will only be turned on during the church services. The church measurements are 40 x 80 ft. with a 16 ft. ceiling. We want to figure for an attendance of 300. The two 80 ft. walls are brick, lathe and plastered. The two 40 ft walls are inside walls to other rooms which are not to be cooled. The ceiling is insulated with 4 inches of insulation. There is a basement under the main floor.

When we built the church, we had the duct work installed overhead. Now all we must do is install the refrigeration machinery. Please be so kind as to inform me, how many tons refrigeration will be required to properly cool



all new

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this building and what will be the suction pressure. There is approximately 3000 watts of lighting. The blower unit will be located in a room next to the auditorium.—W.H.B., Baltimore, Md.

ANSWER: An accurate estimate of the cooling load for your church cannot be made without a complete set of plans and specifications. Also the suction pressure can only be stated after engineering computations are made based upon the equipment to be used. A few approximations, however, can be made. It is understood that these approximations should not be used for design purposes.

Theaters in your locality require about 0.05 tons per seat. Churches have considerably larger volume per seat and usually have rather large window area; hence, the cooling load per person is considerably larger than for a theater. Probably the cooling load required to maintain 75 F DB and 50 per cent RH in your church will be between 0.06 and 0.08 tons per person, and the suction temperature will probably be between 35 and 40 F.

Because of the large required load and short period of operation, it is often economical to use ice storage systems for churches. We are having forwarded to you, a reprint of a paper by J. A. Wilkerson and A. P. Boehmer, field engineer and chief engineer, respectively, Dole Refrigerating Co., Chicago. The title of this paper is "How to Cool a Church Economically". It will be very helpful to you in your considerations. — N.S., San Luis Obispo, Calif.

Challenges Caption With July Electrical Series

QUESTION NO. 1075: Regarding Howard Wolfberg's excellent article in July '55 IR, there is one part which I believe is in error. The caption under Fig. 9 reads as follows: "Comparison of light bulb hook-up with conventional 110-volt bulbs in series (a), and special 220-volt bulb (b). Relays may be wired up similarly." I disagree.—H.B., Chicago.

EDITORIAL NOTE: Unfortunately, our technical department got a little mixed up in preparing the legend for Fig. 9. Mr. Wolfberg's statement follows:

ANSWER: Operating coils for alternating current relays, contactors, solenoid valves, etc. should never be wired up in series. This is due to the extremely high inrush currents which the coils draw before their armatures are drawn up into the operating position. In this case, the tremendous current drawn by one of the coils before its armature has closed may drop the voltage in the line to the point where the other armature, which has already closed, may pull out. The result is that the relays chatter and their operating coils soon burn out. — Harold Wolfberg, Chicago.

Freezing Pre-Cooked Meals

QUESTION NO. 1076: What is the recommended temperature for blast-freezing pre-cooked meals? What is the recommended cfm per say 100 lbs. of produce to be frozen? Are other methods of freezing pre-cooked meals preferable to blast freezing? What is the lowest temperature that single stage refrigeration using "Freon-22" as refrigerant is recommended? When would you recommend using two stage compression?

The problem in question is the construction of a freezer to freeze approximately 200 lbs. of pre-cooked meals per hour. The meals are on an aluminum tray and it is intended to have the trays on multi-decked trolleys which are wheeled into and out of the freezer room. Storage to be in another room at minus 5 to 0 F. It is assumed that it would take about ½ hour to freeze each batch. Insulation suggested: 10 inches slabcork; ambient temperature, 80 F; water, 75 F.—B. Sachs, Johannesburg.

ANSWER: The time of freezing depends on air temperature, air velocity, and method of packaging of the the food. Pre-cooked food may be frozen from −20 F to −40 F. If single stage "Freon-22" equipment is used, −20 F would be preferable because of the rapid decrease in capacity with the lowering of the suction temperature. It is doubtful, however, that the food would be satisfactorily frozen in one-half hour.

A temperature of −40 F with two stage equipment would give quicker freezing than that obtainable with single stage equipment. If two stage equipment is used, a discharge line oil trap should be installed on the higher temperature compressor and the oil from this trap should be discharged into the crankcase of the lower temperature compressor. There should also be a pressure equalizing line between the two crankcases so that the pressure in the lower temperature crankcase will be maintained at the suction pressure of the higher temperature machine. The single stage system would be easier to operate and would probably be preferable on this project.

The air quantity should be selected so that its velocity over the product will be 300 to 400 fpm. Higher air velocities will not appreciably increase the rate of freezing of packaged food.

Careful consideration should be given to the method of packaging since this factor is of equal importance to temperature or air velocity when considering the time of freezing. — Harold P. Hayes.

On Auto Air-Conditioners

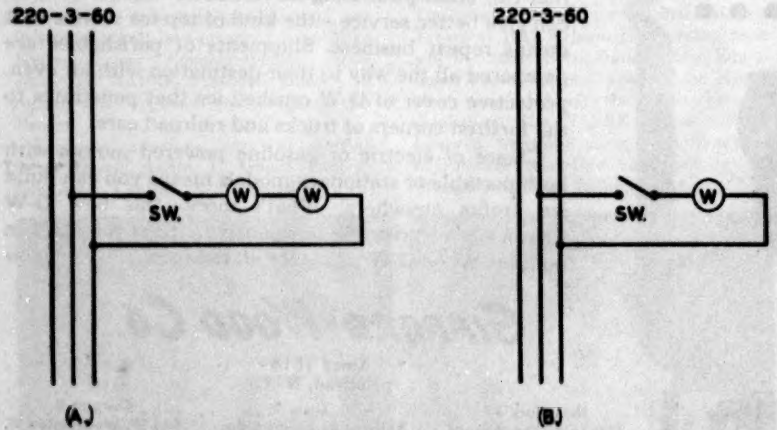
QUESTION NO. 1077: I have recently seen a number of publicity releases on automobile air conditioning systems. Do these employ the usual vapor-compression systems? What are their capacities? Can you give me a brief description of a typical installation?—R.A.W., San Luis Obispo, Calif.

ANSWER: A number of manufacturers are now marketing air conditioning systems for automobile applications. Some of these involve a number of sub-assemblies which are installed in the automobile on a sort of custom installation basis. The trend, however, is to the type of unit now marketed by the Frigidaire Division of the General Motors Corporation. The Frigidaire system is a complete package-type unit which consists of three major components: compressor; condenser-receiver-dehydrator filter assembly; evaporator. The package unit is designed to incorporate heating also so that the system is a true year-round air conditioning system.

The compressor is a five cylinder axial type (wobble plate) with a displacement of 9.28 cubic inches per revolution. The condenser is of all steel construction using ten 3/16-inch diameter tubes in parallel, grouped in two rows of five tubes each. The evaporator uses the same type of finned tubing used by many manufacturers of room air conditioning units. One of the highlights of the system is the fact that flexible hose is used to replace the copper refrigerant lines used on early systems.

In assembling the unit, the components are positioned on an assembly rack in the exact relationship to each other as they

(Continued on page 60)



Comparison of light bulb hook up with conventional 110-volt bulbs in series (a) and special 220 volt bulb (b). Relays may be wired up similarly.

High Gear for Next Year Theme of Annual Ice Convention Los Angeles November 15-18

THE theme for the 1955 Convention of the National Association of Ice Industries will be "High Gear for Next Year", and the entire program will be based on this and closely related ideas. The convention will be held at the Biltmore Hotel, Los Angeles, November 15-18. The program will be made up of reports from officers and staff members, outside speaking talent, talks by ice men, and the usual exhibits of ice making machinery and supplies.

Paul H. Andres
President NAII

Primarily it will be an Ice Man's Convention, a pooling of ideas from people of the industry, discussing things the members will want to hear about, describing ideas they will want to know more about, talking on everyday methods of doing a better job of running an ice business. In addition, a change of pace, viewpoints and ideas will be presented from outside the industry from dynamic and forceful speakers.

Headline Speakers

Carl P. Miller, Executive director of the Pacific Coast Edition The Wall Street Journal and President of the Los Angeles Chamber of Commerce will address the Convention Tuesday on "Keeping Pace with Growth in this Western Empire". His talk will deal with the fabulous growth that is now taking place in the country and the important part that the ice and cold storage industries play in this progress.

W. Ballentine Henley, President of the College of Osteopathic Physicians and Surgeons will give an address: "Put your Frustrations on Ice", Wednesday. In addition to being president of a college, Dr. Henley for ten years has been president and board member of the Water and Power Commission of the City of Los Angeles. He is one of the nation's foremost platform speakers. For a quarter of a century, he has inspired audiences from Maine to California.

Rilea W. Doe, Vice-president Safeway Stores, Oakland, will speak at the Thursday session. Mr. Doe has been with Safeway since 1919. He's a member of the American Marketing Association, the National Association of Marketing Officials and the National Sales Executives Association. He is a former president of the Western States Chain Grocers Association and vice-president of the National Association of Food chains.

The convention will be under the direction of Paul H. Andres, president, of the Southwest Ice and Dairy Products, Oklahoma City, Oklahoma, as he rounds out two successful years as NAII President. At the time he became president in 1953 he prepared a series of regional conferences to bring the National Association and the member companies in closer contact. During the last two years, 30 of these conferences have been held over the country. Many have acclaimed this as one of the finest programs the association has ever undertaken.

Practical Talks by Ice Men

This phase of the Association's service has been given full recognition in planning the 1955 Convention program. Each session will provide for a period of discussion of any and all subjects of interest to Icemen. The exchange of ideas will not be between just two or three people, although there will be lots of time during the Convention for this type of conference, but between all those present. This will be an opportunity to draw on many man-years of experience in the Ice business on any subject chosen.

On the strictly practical side, there will be talks by ice men about some phase of their operation in which they have been outstandingly successful. The vending of Ice has become an important part of the answer to the changing Ice business. The Detroit market now has about 170 ice vending stations. The selling of Ice in this great market has become a matter of making it conveniently available to every customer, and then pushing its sale through an organized promotional program. Walter Hintz of Borin Bros., Detroit, will tell about this fabulous development, how it came about, and what it has meant to the ice manufacturers of that city.

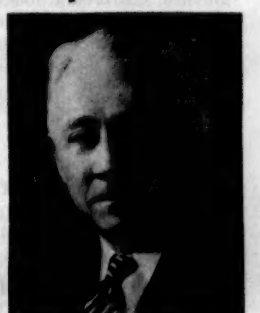
The Liebman-Arctic Ice Company of Oklahoma City has given the distribution of packaged ice through retail stores a big whirl. Earl Johnson will give a full and interesting report of how they did it, the problems they encountered, and the results they achieved.

Precooling and Hydrocooling have been of widespread interest and value to the Industry. Opportunities in this field are increasing rapidly. Vacuum cooling of lettuce and other vegetables is becoming important in some sections. The Pacific Coast has been in the heart of both developments. J. C. Rear of the Union Ice Company of San Francisco and member of the NAII Research and Marketing Com-

Trio of Headline Convention Speakers

Carl P. Miller

W. Ballentin Henley



Rilea W. Doe

mittee, will discuss and evaluate these developments.

In the Pacific Northwest, the Rainier Ice and Cold Storage of Seattle has used approaches and methods that have been particularly successful in getting and keeping commercial business. Ray Burgess, Jr., will relate how it was done. Mr. Burgess has some ideas that will interest all ice men.

In recent years the poultry icing business has boomed. It has been of great value to many ice manufacturers. Others have benefited in only a small way. Paul Ashley of the Central California Ice Company, Fresno, has a real success story to relate. He will discuss the angles to the development and keeping of this business.

In Jacksonville, Florida, The Duval Ice and Cold Storage Company has completed a great modernization program. It includes significant changes in both production and marketing methods. Ray David will speak on the changes which were made and what they have meant to the operation.

Mechanization

With mounting wage rates and increasing sales of processed Ice, greater use of machines, methods and devices must be employed if production costs are to be held down. A few companies are taking an active lead in mechanization. One company which has done an outstanding job in this field is the National Ice and Cold Storage Company, San Francisco. Ken Sartori will relate what they have done, how they did it, and how it paid off.

George Heath, Madison, Wis., one of the country's most progressive Icemen, will present the exhibitors at this year's equipment show. Certainly, this is logical, since George's company has been quick to take advantage of new and better methods of manufacturing and marketing ice.

The safety program of the Crystal Ice & Cold Storage Company of Sacramento, California, has gained widespread recognition. Saftey is an activity which everyone considers desirable, but many have trouble keeping the steam up. A. R. Carstensen will discuss this all-important subject, and tell how to get tangible results.

Ice men as well as a lot of other business men spend a lot of time trying to forecast the future of their business. One of the deans of the Ice Industry, General P. A. Weatherred, is well fitted by experience and temperament to come as near making a valid analysis of the ice business as any ice man in the country. Through the General's long and close association with the problems and developments of the Industry, he has developed an exceedingly firm grasp of the business' economic trends. For the benefit of conventioners he will take a brief look into the past, do an analysis of the present, and give a forecast of what's ahead.

The Association officers and staff will acquaint the members with the Association's program and objectives, and the progress which is being made. They will tell of developments within the Industry and their significance to the future welfare and prosperity of the business. They will receive a first-hand, up-to-date report on the status of all Association projects.

Equipment Show

Exhibits and exhibitors have always occupied an important place in Ice Industry Conventions. This year it looks like the equipment show is going to be better than ever! By convention time, it is expected that all available exhibit space will be sold. In fact, arrangements have already been made to take care of the overflow when the Exhibition Hall is filled.

There will be many familiar faces among the exhibitors. Since the meeting is on the West Coast, there will also be a number of newcomers. Standard items with new improvements will be on display, and there will be a number of new labor-saving and cost-cutting devices which have not been displayed before.

Entertainment

Those who are looking for entertainment will never have a better opportunity to combine business and pleasure than by going to the 1955 National Ice Convention. There's nothing like a trip to the West Coast for entertainment. Travel across the country is flexible. There are many routes; you can go one way and return another. Stop-overs make it possible to visit the places chosen, do the things you want to do and see the things you want to see.

Los Angeles is full of entertainment possibilities. It's the movie capital of the world. Many of the national TV shows are filmed or originate in Los Angeles. During the Convention, members and guests will dine and dance to the music of a big-name orchestra. They will be entertained by headline performers in the fabulous Biltmore Bowl. They will have an opportunity to visit the world-renowned Disneyland. Some will want to visit the movie studios. Others will want to see the homes of the celebrities. Still others will want to take in the night spots. Some may want to do all of these things and more too.

Enroute to and from the Convention it will be possible to visit Yosemite, Grand Canyon, Carlsbad Caverns or many of the other scenic attractions of the West which are open this time of year. Some may elect to spend some time in San Francisco, Las Vegas, Reno, Phoenix, Denver, Salt Lake City, Cheyenne, while others will include Mexico or a trip to colorful Hawaii.

Transportation Family Rates

The air lines and the railroads have family plans to the Coast. By plane, if you buy two one-way fares for yourself, your wife can accompany you on the round trip for only a one-way fare. Other members of the family also get a bargain. The railroads offer family rates for most of the country, too. When the husband buys a round trip to the West Coast, he can take his wife with him for a one-way fare. There are some restrictions on the days of the week when family fares apply, but that's no problem. It just takes a little additional looking ahead and planning.

American Ice Reduces Stock

THE American Ice Co., continuing the reduction in its outstanding stock, acquired 7,800 shares of common in August. Last year the firm purchased 15,000 shares of common in the open market and thus far in 1955 has acquired an additional 11,600 shares, reducing the outstanding common to 382,235 shares. The firm has been reacquiring its stock, both common and preferred, for six or seven years and has reduced the amount of the senior issue in the hands of the public to 12,000 shares.

Louisiana Ice Plant Burned

A FOUR-HOUR fire which destroyed the only ice plant in a four-parish area resulted in a complete loss of the Bradford Ice plant, Jena, La., at a cost of $75,000. C. A. Bradford, owner of the plant, said the loss was partially covered by a $30,000 insurance policy. Firemen fought the blaze frantically to prevent it from igniting the plant's ammonia tanks nearby. Firemen speculated a motor in a new freezer unit may have caught fire.

NARW Cited For Safety Program

THE National Association of Refrigerated Warehouses was among the eleven associations which did outstanding work in preventing occupational accidents during 1954 and received the National Safety Council's association award from David L. Arm, manager of the Council's industrial department, at a special luncheon meeting for association executives and volunteer officers, October 19, during the 43rd National Safety Congress and Exposition in Chicago. The Association Award recognizes the general excellence of association safety services, particularly for their contribution to the reduction of work injuries in small firms.

Safety activities such as publicity, safety conferences, contests and the publication of technical materials were taken into consideration by the Council's committee of judges. Members of the committee were Fred W. Braun (chairman), vice president, Employers Mutuals of Wausau; A. M. Baltzer (secretary), director, Small Business and Associations Committee, National Safety Council; William Barton, manager, Labor Relations Department, Chamber of Commerce of the U. S.; Alfred G. Larke, employer relations editor, Dun's Review and Modern Industry; Thomas M. Brennan, vice president in charge of inter-association relations, National Association of Manufacturers; S. R. Christophersen, president, Smaller Business of America, Inc., and Reuel Elton, manager, American Trade Association Executives.

The Association received the award for the general excellence of its safety services, particularly for its contribution to the reduction of work injuries in its member plants. F. D. Newell, Jr., president of the association, received the award on behalf of the industry. The National Safety Council's award was the second citation the Association's safety program has received in the past three months. In August, it was awarded a Certificate of Recognition by the American Trade Association Executives.

Since the start of the industry's safety progress in 1952 the frequency rate has been reduced from 38.6 to 29.685; the severity rate from 1.84 to 1.03 and the number of plants without a lost-time accident increased from 13 to 51.

Railroads Deadhead Pallets

THE Interstate Commerce Commission has voted not to suspend railroad tariff provisions whereby railroads would make no charge for transportation of pallets, platforms, or skids used in connection with loaded movement of freight on all commodities from and to points in official territory. These provisions had been protested by the Central States Motor Freight Bureau Inc., which argued that if these provisions became effective, shippers would demand "similar treatment from the motor carriers with the ultimate result of loss of much needed revenue for all concerned.

New Cold Storage Unit Added

A FIVE-MILLION pound capacity cold storage plant, with an approximate cost of a quarter of a million dollars will be ready for operation at Albuquerque, New Mexico in about ten weeks, according to E. D. Sweenhart, vice-president of the New Mexico Cold Storage Company. The plant is being installed in a 15,000 square foot building in a truck depot building recently purchased by the company. A private 700-foot Santa Fe Railway spur to the building is being provided and loading docks to handle 20 trucks are available.

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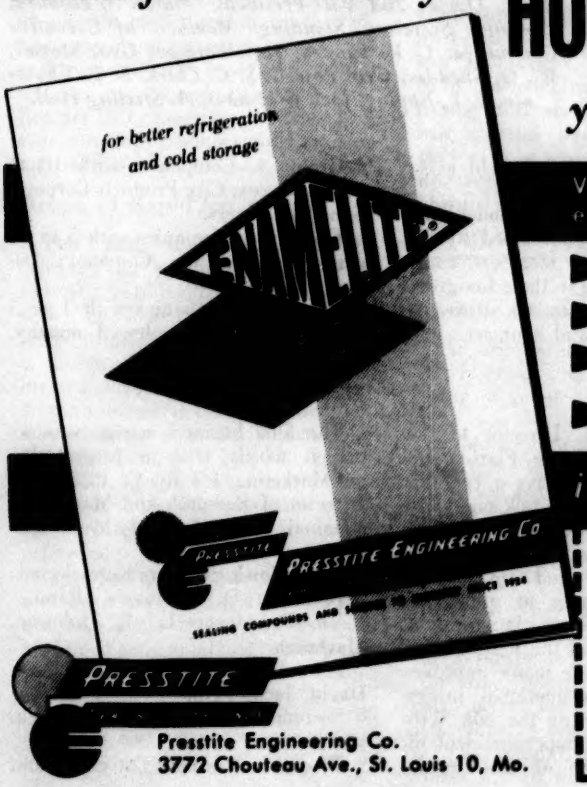

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Florida Ice Association Annual Meeting

THE 30th Annual Convention of the Florida Ice Association was held at Daytona Plaza Hotel, Daytona Beach, Florida, October 10 and 11. One of the more important events in the program was the second annual report of the Florida Ice Industries Safety Program. This report was prepared and presented by the safety division of the Florida Industrial Commission. In connection safety awards were presented to four ice companies.

In the annual report of the President, J. S. Earman, called attention to accomplishments during the past two years including increased safety work, development of an insurance plan, watching state and national legislation and establishing a main objective for all association work.

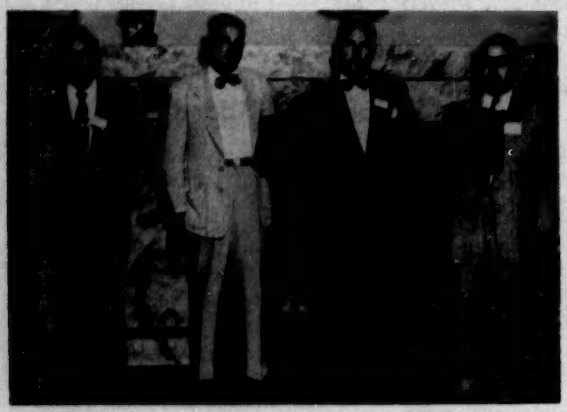
Reporting for the Insurance Committee, T. K. Keiser, representing the corporate group service, explained the self-insurance plan in detail. Under the plan proposed each member of the association would pay into a trust fund the same premium as he is now paying as a regular insurance carrier. The principal benefit is the saving of money on a fixed operating cost of business.

Dr. Frank Goodwin, Professor of Marketing at the University of Florida, gave a talk on "The Hole in the Donut" a very clever and thought provoking talk on human relationship and salesmanship.

The principal speaker of the afternoon was C. T. Baker, consulting engineer of Atlanta, Georgia, who talked on "What Price Plant Maintenance" covering mostly case histories concerning innumerable high priced properties which are being heavily penalized by the effects of deferred maintenance and failure on the part of the management to develop and insist upon following a well organized maintenance program.

Scott Johnson announced that a chapter is being formed in Tampa for the National Association of Practical Refrigerating Engineers and that meetings are being held every Thursday evening.

It was suggested that a model letter be drawn up and developed by the association so that members could follow it in writing to their Congressmen and Representatives with respect to the wage and hour act.



Winners of Safety Awards in Florida Ice Association Safety Contest: Group 4 — Royal Palm Ice Co., Wildwood, Fla., W. M. Means, Manager; Group 1 — Malone Ice Co., Malone, Fla., L. E. Johnson, Co-owner; Group 2 — Atlantic Co., Deland, Fla., R. F. Tibbs, Gen. Mgr., Southern Division; Group 3 — City Products Corp., Ft. Myers, Rot Hickman, Div. Mgr.

Officers and members of Executive Committee, Florida Ice Association. Seated, Herman Osteen, Treasurer; L. E. Johnson, 1st Vice-President; D. W. Browne, President; R. A. David, 2nd Vice-President; Muriel Washburn, Executive Secretary. Standing: Members of Executive Committee: L. R. Kinney, J. S. Earman, Geo. Stovall, W. O. Shaddix, Geo. Powell, S. C. Clark, B. F. Thomson, E. E. Epping, Jack Whisnant, A. Sterling Hall.

Safety Progress

A. P. McIntosh, Director of the Safety Division of the Florida Industrial Commission gave a very interesting and practical talk on safety in which he commented on the cooperation between the commission and the Association and said that the commission continues to offer this service, but that the association might do its part. He said the ice industry in Florida has made many improvements in their occupational injury experiences. Following the talk William T. Bodiford, Superintendent of the Safety Division of the Florida Industrial Commission presented a merit award to those companies which had no loss of time nor accident during the past year.

L. H. Stein, Chairman of the Safety Committee of the Florida Association spoke briefly on the four regional safety meetings held during May and June. He said they were well attended and that at each a representative of the state highway patrol gave a talk on reduction of vehicle accidents. Mr. Stein awarded safety plaques to the following:

Group 4—Companies with 25 or more employees: Royal Palm Ice Company, Wildwood.

Group 3—Companies with 10 to 25 employees: City Products Corporation, Fort Myers.

Group 2—Companies with 5 to 10 employees: Atlantic Company, Deland.

Group 1—Companies with 1 to 5 employees, Malone Ice Company, Malone.

Marketing Ice

The final business session was occupied mostly with a presentation on Marketing Ice by C. P. Austin, Director of Research and Marketing, National Association of Ice Industries.

The following officers were elected:

President: D. W. Browne, Miami.

Vice-President: L. E. Johnson, Marianna.

Second Vice-President: R. A. David, Jacksonville

Secretary: Muriel Washburn, Jacksonville

Treasurer: Herman Osteen, Miami

Five Years Progress in Rapid Ice Freezing

EUGEN WILBUSHEWICH
Rapid-Ice Freezing, Ltd.,
Zurich, Switzerland

Rapid-Ice freezing, a process developed in Zurich, Switzerland, and described previously in two articles in *Ice and Refrigeration* (August, 1950 and January, 1952) has found particular favor in some European and Middle East countries because of its economical production costs. The author of this and the two previous articles, Eugen Wilbushewich, designer of the new process, is a mechanical engineer with experience in the design, construction, and operation of refrigeration equipment and plants.

Recognizing the inroads made by small quantity mechanical ice producing machines into local ice distributing businesses, and the fact that they are economically answering these needs, the author carefully points out that his equipment is not intended for this field. Rather, he believes, his process and equipment will be of interest to smaller industrial ice manufacturers in the U.S., who are faced with replacing obsolescent equipment and keener competitive marketing of larger operators. In a field of declining number of firms, and accompanied by falling annual production figures, this article which indicates hope of reduced production costs, should be received with much interest.

NEW DETAILS can now be added to the information which has been published in various international refrigeration journals, particularly in ICE AND REFRIGERATION, on the ice freezing process known as "Rapid-Ice". This process, which utilizes direct expansion refrigeration, invented some seven years ago, is now in practical use and it could be described as an intermediate method between the brine tank block ice manufacturing process and the production of small sized ice such as cubes, tubes, flake ice, etc.

In general, particularly in the United States, the sale of block ice for domestic and small commercial use has been declining, while its place is being increasingly taken by the small ice forms mentioned above which are available in more convenient ready-to-use form.

The automatic production of small sized ready-to-use ice has given a particular impetus to the inventive technologist in both manufacturing and distribution. As an illustration, this type of ice is being packed in paper bags and cartons, making it more convenient for both the distributor and the user. But the fact still remains that every type of fresh water ice, whether in block form or small-sized, has a temperature near 0 C (32 F) and contains the equivalent of 80 calories per pound calories* (144 Btu per lb.); therefore it cannot provide any lower temperature than its natural capacity.

Origin of Rapid Ice

The "Rapid-Ice" process was developed and patented by Rapid-Ice Freezing, Ltd., Zurich, Switzerland, which has leased patents on a worldwide basis since 1948. Since that time a dozen large plants have been erected, many of which are in Italy. In the summer of 1955, a model plant was constructed at the International Fairs in Milan, Italy (see Fig. 1), and also Bologna and Padua, Italy, where it caught the special attention of the Italian Minister of Transport. Italian refrigerator car operators tested the "Rapid-Ice" product starting in 1953 and have used it since then. There are also some larger plants in the Middle East, supplying mainly domestic needs.

*The pound-calorie (lb-cal) is the amount of heat required to raise the temperature of one pound of water one degree Centigrade.

Specific Improvements Cited

An original difficulty in the rapid-ice freezing process, as a result of using a single internal evaporator tube, was the brittleness of the 56-lb. ice block after a freezing time of only three hours. This could only be corrected by a sufficiently long storage or "seasoning" of the newly manufactured blocks. This difficulty was finally resolved by using five internal evaporator tubes, with a specially designed mechanism which discharges the blocks from the ice molds at a slower rate. It was found that the five internal evaporator tubes provide the ice blocks with a tougher structure as shown in Fig. 2.

The freezing process which takes place rapidly and simultaneously outside each tube and in the interior of the ice molds, as a result of the accurate distribution of the internal evaporator tubes, is really the heart of the rapid ice freezing system.

There are also some improvements in the circulation of the ammonia, but the principal advantage of the rapid-ice freezing process is that the 56-lb ice blocks can be harvested ten times daily from each mold, as against a maximum of one-and a half times per day with the brine-tank system. Also important is that there is a saving of about 25 percent in electric current consumption. All this adds up to a considerable advantage which is likely to be decisive in the calculation of costs for any new ice manufacturing project, or for any repairs or remodeling of existing ice plants. In the latter case the brine-tank could be discarded and a rapid-ice freezing unit installed, capable of the same output, but taking only one-seventh of the former floor space

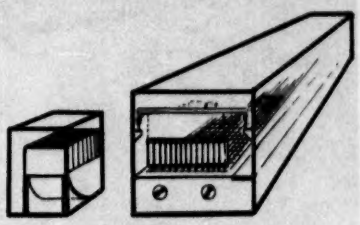


Fig. 1 — Comparison by scale drawing of space requirements for a "Rapid-Ice" system and a brine tank system for ice making. Author claims only 15 percent of present floor space requirements would be required for this equipment.

In Europe, particularly in the southern countries, where there is considerable use of ice, automatic apparatus for the production of small-sized ice and domestic electric refrigeration will not replace block ice to the extent that it has in the United States. Particularly not if it can be shown that there is a way to reduce the cost and to streamline its manufacture. Also it may be assumed that in Asia, Africa, Australia, and South America, similar conditions exist with respect to continued use of block ice. One important fact is that the fishing industry will continue to rely largely on block ice to meet its refrigeration needs.

Freezing Sea Water

Among block ice manufacturers, it was considered until recently, im-

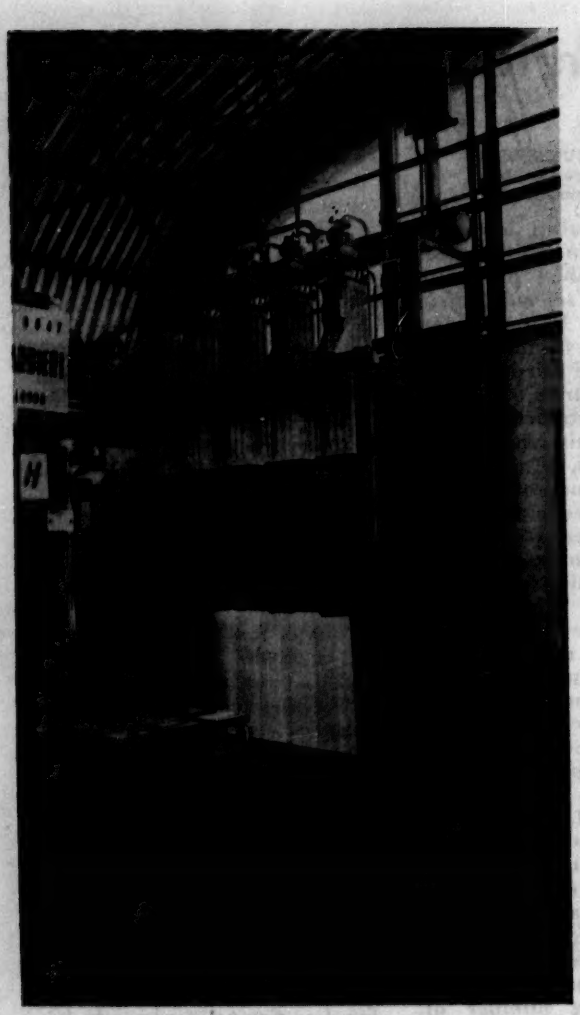


Fig. 2 (left) — The Italian refrigeration firm Costruzioni Meccaniche Barbieri exhibited in its booth at the International Fair in Milan a model "Rapid-Ice" plant for the production of 56-lb ice blocks within a freezing time of two hours at minus 15C.

Fig. 3 (below) — Cross-section of a 56-lb ice block. The square noticeable in the center of the ice block is formed by the five internal evaporator tubes, although they are circular in shape. This is a consequence of the accurate distribution of the evaporator tubes. Exactly where the ice-circles collide, the formation of ice crystals stops and a regular square is formed.

possible to produce ice blocks from sea water without precipitation of its constituent salts because the increasingly concentrated salty water collected in the center of the ice block during the freezing process. But with the five internal evaporator tubes of the rapid-ice system, a normal 56-lb block of ice can be produced from sea water with 1½ hours freezing time at minus 22C (−7.6F) without any separation of the salt.

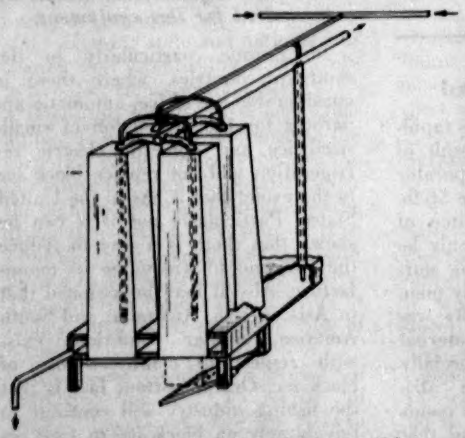


Fig. 4 — In order to freeze the lower lid watertight to the bottom of the mold, a small part of the refrigerant is used as external evaporation. The ice formation in the molds is affected by the internal evaporator tubes only.

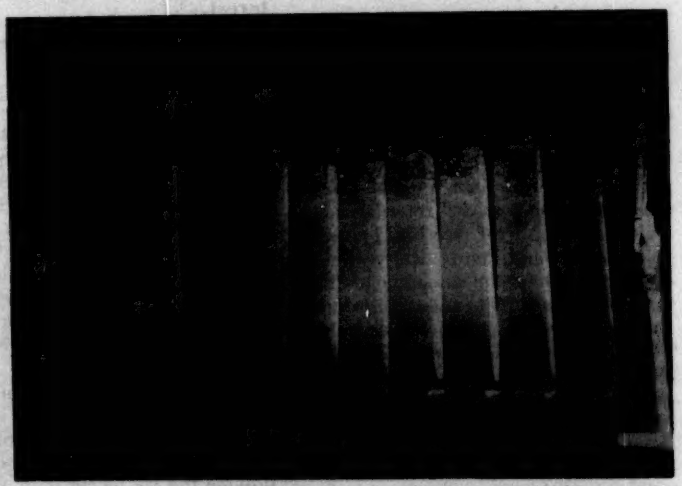


Fig. 5 — Large model of the harvesting equipment below the "Rapid-Ice" batteries, receives every ice block individually from the molds but conveys them in groups to storage.

It was found that such blocks have many advantages for the transport of fish, as particularly sea fish can be better preserved when covered with ice consisting of the same water in which they have lived, and which contains all its constituent substances, like chlorine, bromine, iodine, etc. Certain physical properties of the sea ice also have been observed. For instance, when stored ice and fish layers are defrosted, the salt dissolves and is precipitated on the underlying layers. This is quite desirable, since this maintains the temperature of the ice for a longer time.

Those engaged in transporting fish have learned this, and for this reason they prefer ice blocks made from sea water. Rapid sea-water ice has the further advantage that it is elastic, and that its crystals are not sharply pointed. Fish can therefore be stacked much higher on such crushed ice than could be done when using fresh water ice.

Fruit Juice Concentration

In Massalombarda, Italy, where a number of rapid ice plants are in operation, attempts have been made to freeze, at minus 40 F the concentrated essences and juices of fruit directly into 56-lb blocks. The results have been very satisfactory, and further developments in this field are expected soon.

Manufacturing Disadvantages and Control Problems Noted

Normal hand valves for ammonia and "Freon" are still required, as the big plants do not yet obtain good results from application of magnetic valves. The difficult welding jobs, especially of the external evaporator space around the ice molds require exact technique to obtain proper fit. Some leeway in this is allowable and a streamlining of the construction by utilizing internal evaporation has been found feasible.

Part of the British patent obtained last year for expediting mass production is shown in Fig. 4. Owners of rapid ice plants are making extensive use of this mechanism, and it is finding an increasingly wider use. The normal internal and external evaporator construction utilizes batteries of four to twenty molds, arranged in a single row. Batteries in two rows have been found too inconvenient. A small part of the refrigerant is evaporated in the box-like structure at the mold openings, in order to freeze the lower lids watertight. Ice formation in the molds is by the internal tube evaporators.

Harvesting equipment mounted upon rollers is shown in Fig. 5. This device receives individually the ice block from each mold. The blocks are dropping down onto this equipment and are then rolled into the ice storage. Other mechanized handling is possible.

A rapid ice plant for 100 tons output can be erected within a few days on a skeleton iron construction. It is possible to dismantle this and move it to another site, with no loss incurred from demolishing the building or framework. This advantage appeals to many who may want to invest capital in the establishment of an ice manufacturing plant for very limited seasons. Such a plant would be in reality, portable.

Brine-Tank Vs. "Rapid-Ice"

Ice production with a brine-tank system needs at its inception at least three days preparatory starting operations until the first ice is ready. By contrast, rapid-ice plants, within two hours, supply a continuous flow of ice blocks ready for immediate sale. At an up-to-date ice plant of this type the freezing time is two hours at 5 F. the filling time eight minutes, and the defrosting time only.

(Continued on page 60)

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IRVIN R. KRAMER, Vice President
Mercast Corporation, New York

BECAUSE of the increasing demand for parts in a wide variety of metals possessing intricate and complex shapes, the use of the frozen mercury process in producing parts to exacting specifications and at an economical, overall cost, has assumed a vital role in today's production processes. In such fields as petroleum and heavy chemical processing, power generation and transportation, metalworking and allied industries, food processing, electrical and electronics, the trend has been sharply pinpointed toward increasingly rigorous demands on equipment for more rapid and efficient operation.

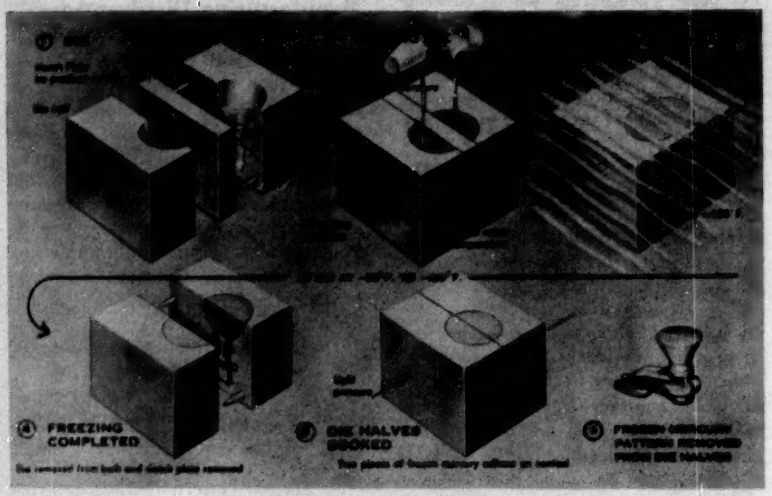
The higher temperatures and pressures, as well as the reduction in size of components, has resulted in higher stresses; the introduction of new industries, such as radar, has increased the demand for parts of more complicated shape and more accurate dimensional tolerances. To design systems and equipment that withstand these new conditions, new materials and complex shapes have been required. The greater use of the high nickel and chromium alloys, the refractory alloys such as the colbalt-base materials, and many new alloys have imposed conditions that could not be met with conventional production techniques.

Under most circumstances, sand casting, forging, and machining methods cannot successfully produce parts of complicated shapes and exact tolerances from these materials. For conventional materials such as aluminum, magnesium, and the brasses, bronzes, and steels, these new conditions have resulted in demands for complex shapes which cannot be met by conventional casting methods without a prohibitively high cost.

The Frozen Mercury Process

As indicated, a solution to these problems has been found in a new phase of the production of parts which employ the investment casting process. Utilizing frozen mercury instead of wax and plastic to form expendable patterns, more and more complex shapes have been developed with critical surface finishes and tolerances; larger and larger parts have likewise resulted.

The frozen mercury process may be explained as follows (and as pictured in top photo). Liquid mercury is poured into a steel die (Fig. A) which is then immersed in a freezing bath at or below minus 100° F. Because it is a liquid, mercury has definite advantages over wax or plastic in filling all areas within the die.



Sequence of operations necessary to form a frozen mercury pattern includes the pouring of mercury into a metal die, freezing, then booking. The result: a complete one-piece frozen mercury pattern.

Fig. A — The first step in the operation is the pouring of mercury into a closed die. Mercury has favorable "wetting" characteristics; thus insures complete filling of complicated and intricate shapes. The die is then immersed in a freezing mixture (−100 F), until mercury is frozen.

When the liquid mercury reaches a temperature of minus 40° F., it freezes, forming the expendable pattern. The die is opened (Fig. B) and the solid form removed. Where exceptionally complex parts are to be produced, they may be formed as separate frozen mercury patterns, then joined by placing them together under only the slightest pressure. "Booking", the unique ability of mercury to fuse with itself, enables large and very intricate shapes to be produced.

The steel dies, used to form the mercury patterns, are always designed with the booking operation in mind, and as such, constitute dies as well as fixtures. The portions of the pattern are accurately located during booking, by proper assembly, and always with the aid of dowels or jigs.

Fig. B — Opening the assembled die starts the booking operation, basis of the real advantage of the frozen mercury process (as compared with other precision casting methods). The match plate of the die is removed, then the two die sections are brought together and lightly pressed. The surface contact of the frozen mercury is sufficient to cause welding and thus create an integral pattern. See sequence of operation illustration.

Fig. C — Dipping the mercury pattern into a ceramic slurry to build up the thin shell mold around the pattern is the next step. This is done repeatedly until the required thickness is obtained — normally about 1/16 to 1/8 inch. This thin ceramic mold, unique in the frozen mercury process, is the basis of many advantages of this method.

The finished unit is thus formed into a seamless, one-piece pattern, utilizing as many individual sections as necessary to form the desired part.

The finished pattern is then dipped into baths of ceramic slurry (Fig. C) which uses a non-aqueous solvent. Once the resultant hardened shell has attained its thickness of approximately 1/8-inch, the mercury is allowed to melt out at room temperature (Fig. D).

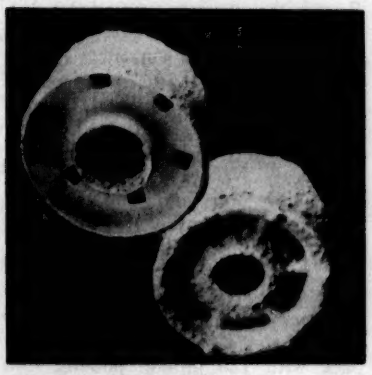


Fig. D — The ceramic mold, after the mercury pattern is melted out, contains a cavity of precise dimensions and shapes. The mold is fired at 1850°F for two hours to obtain a hard-strong structure.

To strengthen the shell mold, it is fired at a temperature of about 1850° F., for two hours. The interior of the mold thus has the desired shape and dimensions with respect to the die. Molten metal as required is then poured into the ceramic molds (Fig. E) and after sufficient cooling, the shell is broken away leaving the finished part. Sometimes, sand blasting or other standard means are utilized to clean the part.

Fig. E — Metal is poured into the ceramic mold. It is possible to exercise a wide choice of pouring and preheating temperatures; grain size and other metallurgical characteristics of the metal casting can be closely controlled. The thin, uniformly permeable ceramic sheet mold permits pressure, centrifugal, or suction casting techniques.

Important Advantages of The Frozen Mercury Process

Unique unto itself, the frozen mercury process allows the production of relatively large parts of very considerable complexities. At present, steel castings have been produced having a diameter of 42 inches and weighing 300 lbs. This is by no means the practical limit of the process which through its facilities, is constantly being expanded to turn out larger and heavier parts.

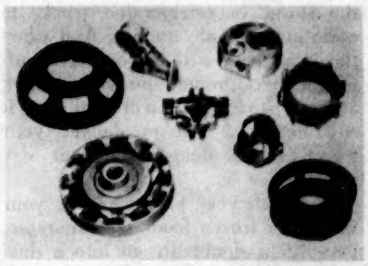


Fig. F — Typical parts formed by the frozen mercury process. Note the complex shapes, hollow sections, thin walls, and large flat areas. Such parts are also characterized by their close dimensional tolerances and excellent surface finish.

The true economy of the frozen mercury process is often found in a comparison of the cost of parts so produced with other methods of casting or forming plus the costs of the additional machining operations required to obtain the required tolerances and surface finishes. Of basic importance is the ability of the frozen mercury method to produce parts with such tolerances and finishes to require the minimum, if any, additional processing, markedly reducing overall costs.

In addition, certain key metals can be cast with the frozen mercury process which cannot be machined under any circumstances. Then too, the thin walls and intricate shapes of many castings often pose insurmountable problems in subsequent machining to make such operations impractical (Fig. F).

And of equal importance are those costs saved through the elimination of other subsequent fabrication operations — riveting, welding, bolting, brazing, etc. — of individual parts to form the completed component. As already indicated, the booking property of mercury enables this process to produce finished assemblies, thus eliminating later, costly joining operations. Accordingly, by appropriate re-design, many components now purchased from the outside, or fabricated internally as separate units, can be obtained as a single integral casting, with the accompanying savings in fabrication, handling, etc.

Refrigerants Used

In the freezing tanks where actual frozen mercury patterns are formed, a CO_2-acetone cooling mixture is used. This mixture is relayed through heat transfer coils into an actual freezing box from a separate compartment. This is done because investment casting firms feel that the oil in the CO_2 might in time contaminate the freezing box. In the dip tank where the frozen mercury patterns are emersed in the ceramic slurry, solid CO_2 is used in acetone to provide the refrigerant method, without the need for transfer coils.

Army Will Handle Food For All Services

UNDER a plan now being prepared in the Department of Defense, the Office of the Quartermaster General will be made responsible for the purchase, storage and distribution of all food for the armed services.

This plan is an outgrowth of the Hoover Commission studies and is being adopted by the Pentagon in lieu of a suggested fourth service of supply. One of its objects is the elimination of so called "cross shipping" by the services which has been criticized by members of Congress.

Grocery Trade Needs More Cabinet Space For Increased Frozen Food Business

AT A recent meeting of leading grocers, F. D. Newell Jr., president of the National Association of Refrigerated Warehouses, advanced the suggestion that they could drastically reduce their assembly and delivery costs, and increase their frozen food sales volume, by an aggressive selling program and by financing increased cabinet space and back-room storage at the retail level. Mr. Newell emphasized that the "lack of storage space for frozen foods is not at the warehouse level, but at the retail outlet.

"One cannot pick up a copy of any frozen food trade publication," he continued, "without seeing at least several articles commenting on the lack of retail display cases and the lack of back-room storage. This lack of freezer space at the retail level is no false issue," he said, "it's a real issue as attested by the fact that the National Association of Frozen Food Packers is now in the midst of an all-out drive to lick this problem. And, in all common sense, no one can refute the logic and reasonableness of attacking this lack of space at the retail level first, and with all of one's resources."

Increase in Frozen Food Sales

Referring to the expected large increase in population during the next ten years and the subsequent increase in convenience foods, frozen foods, Mr. Newell told the wholesale grocers that their industry, as well as the public refrigerated warehouse industry, faces a tremendous challenge.

"The warehouse industry," he said, "anticipates an increased demand for freezer space as this increase in food production materializes. And, the industry is geared to meet the challenge. For the past ten years, our industry has been adding over eight million cubic feet of space a year, most of it freezer. NARW estimates that at the close of 1955, there will be 480 million cubic feet of public refrigerated warehouse space in operation, well over 270 million cubic feet of which will be freezer space, and suitable for the storage of frozen foods. "Our industry has met the demand for increased space," he emphasized, "and will continue to meet any future demand."

Shifting to the wholesale grocer industry, Mr. Newell said that it is apparent that the wholesale grocers are well equipped to handle present demand and that plans are being made for the future, with new grocery warehouses being built and present plants and operating systems being modernized.

"But", he questioned, "what about your future frozen food distribution problem at the retail level? You know, and I know, that the major single factor in the cost of your breakup and delivery of frozen foods is the size of the delivery. Breaking cases and small deliveries are two of your major cost items, and they will become even more significant as your frozen food volume increases. "You can cut these costs and prepare for the future through an aggressive selling and financing program that will increase cabinet space and back-room storage space at the retail level."

Adding Storage Space

Commenting on the merits of wholesale grocers building their own freezer warehouses, Mr. Newell said that "this matter of building your own freezer space as against leasing it is based on a false assumption.

"Admittedly, at the moment, it is more economical for you to make a joint delivery to your stores than to shuttle from the freezer to the grocery house, which is an item of expense.

"However," he added, "I feel, and without fear of contradiction, that frozen foods should be delivered to the stores in refrigerated trucks to maintain ultimate quality. And when the day arrives that you have sufficient back room storage installed at your stores, you will find that it will not pay you to deliver your frozen foods along with your dry groceries.

"As each year passes and as your volume of frozen foods sales increase, you will undoubtedly go into a dual delivery system. Then the advantage of having your freezer space located in your grocery warehouse will become less of an advantage.

Retail Case Capacity

"It seems to me," Mr. Newell pointed out, "that if there is a limit to how much money one can invest, a company should use it to its best advantage. If I were a wholesale grocer, I would use the money to increase the retail case capacity of my stores. I would also install sufficient walk-in freezer space at the store. These two investments will not only produce a large dollar profit in increased frozen food sales, but they will automatically reduce your distribution costs.

"Because," he explained, "instead of delivering one, two, and three cases of the various items, plus a number of split cases, the delivery truck will be dropping off three or four thousand pounds of merchandise per stop, and the net result of this program will be of far more benefit to your operation than putting your money into brick and motar."

Second Highest Production of Frozen Peas Reported

DESPITE some very unfavorable weather during the summer growing season, this year's pack of frozen peas was the second highest on record, according to a tabulation by the National Association of Frozen Food Packers. A total of 222.6 million pounds was put up in both retail and bulk sizes, 7½ percent more than was packed in 1954. The record pack was the 226.6 million pounds in 1953.

Pack figures for the country's biggest producing areas in the West reflected the damage caused by hot, dry weather last June. Over-all production in Western states was slightly below that of last year despite higher packs in California and Oregon. More than making up the difference, however, were big packs in the East — mostly New York, New Jersey, Delaware, Maryland and Pennsylvania — and in the Midwest. Both areas were up 9 million pounds over last year. Following the usual pattern, retail sizes (mostly the familiar 10-ounce package) accounted for more than 58 percent of the total pack with 130 million pounds.

Fresh Orange Juice Shipped to New York

FRESHLY squeezed orange juice, a million gallons of it, will arrive by ship in New York from Florida late in December. Fruit Industries, Inc., has bought an 8000-ton ship from United Fruit Company to carry the juice. From the ship the juice will be piped into stainless steel tanks in a New York Central refrigerated packaging plant for distribution.

Purification of Sea Water by Freezing

SEA water purification by "zone refining" will be studied by scientists at Battelle Institute, Columbus, Ohio, under terms of a contract recently signed with the United States Department of the Interior. The research is part of the Interior Department's saline water conversion program.

"Zone refining", as the term is usually used in technology, refers to a metallurgical process in which a section of a metal bar is melted. Impurities have different solubilities in solid and molten metal. Because of this difference in solubility, the process results in concentration of the impurities at the ends of the bar after the molten zone has moved along the length of the bar. In this way, the major portion of the bar becomes purer than the original bar prior to zone refining.

Battelle engineers, who have considerable experience with this metallurgical purification process, think that zone refining by freezing may be usable for sea water purification. In this case, a frozen zone would be used instead of a molten one. The frozen zone would sweep the natural salts ahead of it. Water re-formed from ice after freezing would be pure enough for drinking and irrigation if this method proves successful. One object of this project is to gather enough basic information about the process to give estimates of the economic feasibility of zone refining sea water.

COMING CONVENTIONS

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 8-10, 1955
Ambassador Hotel, Los Angeles, Calif.
J. RICHARD KELAHAN, Secretary

NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 15-18, 1955
Biltmore Hotel, Los Angeles, Calif.
GUY W. JACOBS, Exec-Secy.

AIR CONDITIONING and REFRIGERATION EXPOSITION
November 28-December 1, 1955
Convention Hall, Atlantic City, N. J.
GEORGE MILLS, Show Director

DELTA STATES ICE ASSOCIATION
December 4-6, 1955
Buena Vita Hotel, Biloxi, Miss.
MRS. EDNA VAUGHAN, Secretary

SOUTHWESTERN ICE MANUFACTURERS ASSOCIATION
December 11-13, 1955
Gunter Hotel, San Antonio, Texas
P. A. WEATHERRED, Secretary-Counsel

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
December 1-3, 1955
Traymore Hotel, Atlantic City, N. J.
R. C. CROSS, Executive Secretary

MISSOURI VALLEY ICE MANUFACTURERS ASSN.
January 9-10, 1956
President Hotel, Kansas City, Mo.
V. A. ESPHORST, Secy-Treas.

AMERICAN WAREHOUSEMEN'S ASSOCIATION
April 9-13, 1956
Hotel Statler, Los Angeles, Calif.
Wm. Dalton, Secretary

NATIONAL ASSOCIATION REFRIGERATED WAREHOUSES
April 9-13, 1956
Hotel Statler, Los Angeles, Calif.
Wm. Dalton, Secretary

Operate Your Evaporative Condensers This Better Way

FRICK evaporative condensers with super-saving water-air control attachments automatically cut over-all plant operating costs.

If you want to save water, save power, and save labor; if you must avoid freeze-ups in winter, and bothersome changes in head pressure the year 'round; if your refrigerating plant runs at times without an engineer—then you need the Frick-Mollenberg automatic condenser super-saving control.

This patented system shuts off the water, and later the fan, when not required. It utilizes water from the compressor jackets. It handles overloads, or pump failure, with fresh water. Water lines are drained in cold weather. Flooding or starving of coolers and coils from fluctuating feed pressures are stopped. These and other advantages are performed automatically, saving the time and labor.

Only Frick Company is licensed to furnish these valuable features. Before buying any evaporative condenser, ask how this super-saving control can reduce operating expense in YOUR plant. The Waynesboro, Penna. Office or a nearby Frick Branch Office will give you detailed information without obligation. Write, wire or phone

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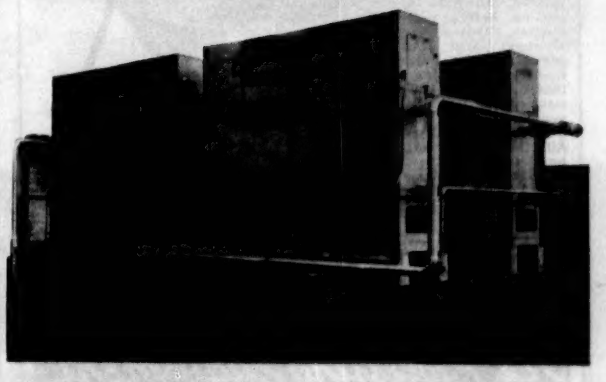

These condensers are among many in Buffalo equipped with Frick-Mollenberg super-saving control.

Refrigeration and Air Conditioning Atlantic City Exhibition

SIX thousand pieces of equipment and parts, valued at almost three million dollars, will be on display at the 9th Air Conditioning & Refrigeration Industry Exposition, at the Auditorium, Atlantic City, N.J., Nov. 28 to Dec. 1.

Atlantic City Auditorium where 9th Air Conditioning and Refrigeration Exhibition will be held Nov. 28-Dec. 1.

The show, sponsored by the Air Conditioning & Refrigeration Institute, will be the first held in the East since 1949 and is expected to attract almost 20,000 visitors.

Greeting these visitors will be some 3,000 engineers and executives, drawn from about 250 exhibiting companies. This expert staff will be the largest group of specialists ever gathered in the air conditioning and refrigeration field and will provide visitors with answers to every type of question.

The show will break all previous records both for size and number of exhibiting companies, as well as for attendance. Displays will cover approximately 88,000 square feet of space.

The general public will not be admitted to the exposition but all persons connected directly with the air conditioning and refrigeration industry or persons in other industries who have an interest in these fields will be welcome. There is no charge for admission.

In addition to the exposition, five industry associations will be meeting in Atlantic City. These are the Air Conditioning & Refrigeration Wholesalers, American Society of Refrigeration Engineers, National Commercial Refrigerator Sales Assn., Refrigeration & Air Conditioning Contractors Assn. and Refrigeration Service Engineers Society.

Orange Juice For Export

FROZEN orange juice is now entering the Israel market. Produced by the Jaff-Ora citrus by-products plant in Rehovat, the concentrate will be directed largely toward the export market. The plant can produce two-and-half-million cans annually. Professor Joseph Bravermann, lecturer on dietetics at the Technion (Israel Institute of Technology) in Haifa and a member of the plant's management, has stated that the juice is prepared according to a formula used by American producers.

A 50 LB. BLOCK ICE CRUSHER FOR $265 with ¾ HP MOTOR

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Model 50

ICE CRUSHER

Operates on a ½ HP. motor. Grinds 50 lbs. in 30 seconds. Makes a very good fine ice. Grate adjustable by turning handle on side of crusher. Staggered teeth on drum. Chute for filling bags. Gears are encased in gear box and run in grease. Shelf to place ice on before entering hopper. Guard covers flywheel. Will take a regular 50 lb. block of ice. Shaft is moulded into the drum. Galvanized for the prevention of rust. Belt & pulley furnished. All steel shell, grate handle and legs. Semi-Steel drum and grate. $230 less motor.

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Ice Processing Equipment

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END BOTHERSOME Hand Purging

NOBODY likes hand purging. It is a messy, smelly, time-consuming job.

But purging doesn't have to be a disagreeable task—not when an Armstrong purger does it for you:

SAVES MANUAL PURGING TIME: Time otherwise wasted on hand purging is saved for other duties.

SAVES PUMPING DOWN TIME: No need to pump down the system after opening it for repairs.

ELIMINATES EXCUSES FOR NOT PURGING: Purging is so easy with an Armstrong purger that there is no reason for postponing the job.

For full details on Armstrong Purging, ask for FREE BULLETIN No. 2211.

ARMSTRONG MACHINE WORKS

860 Maple Street, Three Rivers, Michigan

Southwestern Association Employs Field Secretary

THE Southwestern Ice Manufacturer's Association has employed Ed. J. Williams as a full time field secretary. It will be his duty to spend his entire time in the field, visiting members, with organized and classified information on such matters as price scales, wage and commission rates, profitable marketing developments, precautionary points on wage and hour law, operating and engine room economies, association functions and services. He will seek information on what members are doing to meet their management, merchandising, and operating problems.

Ed. J. Williams

Mr. Williams is from Denton, Texas, elected second vice-president of the Association at the Corpus Christi Convention last February. He is a native Texan. His father was part of Colonel Andy Zilker's organization in Austin for over thirty years. Ed is an ice man by birth as well as by choice. He was a student in mechanical engineering at the University of Texas until the outbreak of World War I, when he enlisted in the United State Marine Flying Corps, where he served for four years. After World War I he again went to work for Col. Zilker, who placed him in charge of Zilker's ice, light and water plant at Llano. After about two years, he took over the management of the Taylor Ice and Water Company, at Taylor, Texas, for Col. Zilker. Thereafter he spent two years in further study of mechanical engineering at A. & M. College. He then went to Wichita Falls as manager of the Marcus' Burkburnett ice operations and later he was with Louisiana Ice & Utilities Inc. and other companies.

In 1946, together with T. C. Scott and Frank C. Collins, both of Wichita Falls, he organized the Public Ice Company that took over the operations of the Louisiana Ice & Electric Co., in Denton and Wichita Falls. Finally, in April of this year, the Denton property was sold.

Safety Certificates

THREE refrigerated warehouses have received safety awards from the National Association of Refrigerated Warehouses for outstanding plant safety records. The plants qualified by going one year or more without a lost-time industrial accident.

Thirteen years is the safety record set by Hermitage Ice and Storage, Inc., Richmond, Va. F. G. Lamb & Company, Weston, Oregon was awarded a two-year safety certificate. Merchants Refrigerating Company, Buffalo, N. Y., received a one-year safety award.

Food Radiation Produces Undesirable Flavor

A CHICAGO research scientist says atomic radiation is still only a "potentially marvelous" process for preserving food." Dr. Walter M. Urbain said radiation destroys spoilage bacteria in food but nearly always produces an "undesirable flavor change" at the same time. No satisfactory way to solve this problem has been found as yet, he added. Dr. Urbain spoke at a meeting of the wholesale cake branch of the American Bakers Association at Atlantic City.

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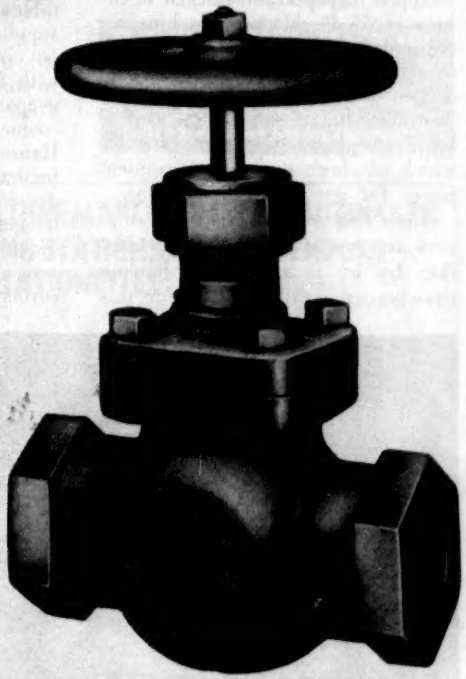
A complete line of Ammonia Fittings for both standard and special applications. Your inquiry invited.



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Dry Ice Distribution Makes Profitable Side Line for Ice Manufacturer

ICE manufacturer, Ray Hansen, owner of the Krystal Ice Co. of Watsonville, California has developed a profitable business accounting for $1800 additional monthly revenue over his income from the ice plant through the distribution of dry ice in the Watsonville area.

Each morning, a dry ice manufacturer delivers the supply of dry ice to the Krystal plant and pays him $10 a ton for all he moves. Since last May, Mr. Hansen has been selling an average of six tons daily and the figure is increasing. He invested money in the dry ice business by purchasing a flat bed truck with a special bin for delivering the dry ice. This cost him $2500 and an additional $400 for four insulated metal bins for the storage of the dry ice. Three of the bins are 6 x 8 ft. and more than 5 ft. deep. Dry ice is wrapped in paper and stacked in the bins in 55 lb. blocks. The bins are covered with 8 in. thick canvas pads to retard evaporation, while the insulated bin walls are a foot thick. The other bin is about one-fourth as large and is used to store dry ice which has been sawed in convenient pieces for use by small concerns.

According to Mr. Hansen, "shippers are just waking up to the fact that dry ice is a 'must' in moving strawberries in this area". For this purpose, dry ice is packed in a specially built crib with shelves located at different levels in the center of trucks and box cars used for strawberry shipping. Each shipment requires from 1000 to 1200 lbs. of dry ice, depending on load, distance and weather conditions. The dry ice, in addition to holding temperatures, retards bacteria, always a bug in strawberry shipping, by cutting down the amount of oxygen in the air, explained Mr. Hansen. The dry ice also keeps berries and other fruits from over-ripening and retards mold and mildew, in shipping. It is a convenient method of retaining temperatures in case of a breakdown of refrigerated motor truck transportation.

Manufactured Ice Used

Much manufactured ice is used in shipping fresh strawberries and vegetables, Mr. Hansen explained. This supplies the necessary moisture which is circulated over the commodity with fans while the dry ice with its evaporating effect keeps the desired coolness. Early in August this year, Hansen put another idea into effect: he developed a side business from the dry ice. With little more investment, he began supplying tanks of carbon dioxide to bars, restaurants, fountains and soft drink bottlers for use in carbonation.

A special scale for weighing the carbon dioxide costs $125. An additional $500 was invested in three used tanks similar to hot water heaters which are used for converting the dry ice to carbon dioxide. He also purchased 150 steel cylinders for $24 each and will buy more as the business increases. These cylinders hold 20 lbs. of gas and last an average small fountain about six weeks.

CCC Losses Set Record

THE Commodity Credit Corporation reports that during its last fiscal year, price support operations resulted in a loss of over $799 million. This is nearly $380 million more than the previous record high loss set the year before. Reason for these big losses is CCC's stepped-up disposal program involving give aways and less-than-cost sales.

As of August 31, CCC uncommitted stocks of butter were 160,329,000 lbs.; cheese 281,763,000 lbs.; nonfat dry milk solids 147,379,000 lbs. Within the past two weeks, CCC further reduced its dried milk stocks by more than 100 million pounds, leaving uncommitted stocks of 40 million pounds. Secretary Benson recently predicted that the government may be able to get out of the butter buying business by the end of the year. Some dairy experts, however, feel that the record amounts of feed grain now on hand will result in greater milk production.—NARW Quick Sheet

Ray Hansen Displays sliced dry ice which he sells to small business firms. The tanks at left are used to convert the dry ice to carbon dioxide.

These men are shown in one of Hansen's dry ice storage bins tossing 55-pound blocks of ice onto the conveyor belt. Note the carbon dioxide tanks in background.

Probable Expansion of Wage Hour Law

A SPECIAL Bulletin has been issued by the National Association of Ice Industries, authored by Wm. T. Jobe, general counsel, calling attention to probable revisions of the wage-hour law that will have an adverse effect upon the ice industry. Although directed to ice manufacturers and distributors, this situation is of interest and concern to many other small businesses as well.

Perhaps the most important is that more than fifty (50) Wage-Hour bills are already on the legislative calendar, all having been carried over from the session just ended.

What Has Been Proposed?

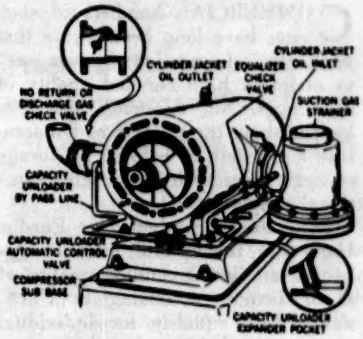
A large number of the pending bills are virtually identical, in so far as language is concerned. As reported in previous bulletins, the Lehman and Murray bills contain by far the most devastating provisions relating to the operations of the Ice Industry. Without detailing either of these measures, here are just two of the major proposals they contain:

(1) A new definition of "commerce" that, if enacted, would make it practically impossible to find any activity performed in this country that would not in some way affect "commerce." Yes, even to the bootblack that might shine a salesman's shoes.

(2) Of equal importance, a further expansion of the Act is proposed, by the elimination of *all* exemptions. These would include the exemptions for "white collar" employees. For the Ice Industry, this would include such persons as managers, supervisors, superintendents, salesmen, etc. In fact, the elimination would include every executive, administrative and professional employee having *anything* to do with Ice that by some technicality or strained interpretation would be determined to be "in" or "for" commerce. The only possible escape suggested for the aforementioned employees is the requirement that they each be paid a minimum of $6,000 per year. Moreover, they suggest the elimination of the "retail establishment" exemption, plus also that the minimum should be set as high as $1.50 per hour, through industry committee determinations.

The Bulletin concludes with the thought that any further expansion of the Wage-Hour Law will be a hardship for many Ice companies.

FES
FULLER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EQUALIZER CHECK VALVE
CYLINDER JACKET OIL INLET
SUCTION GAS STRAINER
NO RETURN OR DISCHARGE GAS CHECK VALVE
CAPACITY UNLOADER BY PASS LINE
CAPACITY UNLOADER AUTOMATIC CONTROL VALVE
COMPRESSOR SUB BASE
CAPACITY UNLOADER EXPANDER POCKET

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Qualified Distributors in principal cities
Low Temperature Freezing Equipment

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Shank Valves have earned a reputation for high quality, long life and dependable products.

Built of highest grade materials with close tolerances —will stand most rigid inspections.

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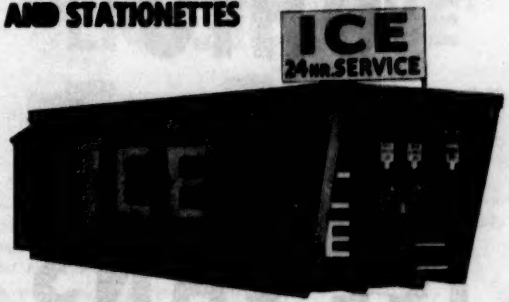

Let Us Engineer Your Problems for Lower Cost Operation and Higher Efficiency

Completely Automatic
24 Hour Service

The complete Ice-A-Teria station and engine compartment are mounted on three 5" I-beam skids with a 1½" pipe located crosswise at front and rear of these beams for ease of loading and unloading.

Manufactured in standard sizes of 8x18, 9x20, 9x24, or built to customer's specifications. All stations have plenty of reserve refrigeration and are universally equipped with an automatic hot gas defrost — efficient — economical operation. Stations are built so rigid that if you jack up the front end of the station, the back end of that side of wall will raise too.

Ask about TIME PAYMENT PLANS.

PERFECTION Ice Scoring Machine Co.
P.O. Box 2140
Fort Worth, Texas

Proper Refrigeration To Maintain Shell Egg Quality

RUTH JORDAN
Purdue University
Lafayette, Ind.

COMMERCIAL handlers of shell eggs have long been aware that adequate refrigeration is necessary to maintain high candled quality of shell eggs. Not so much has been known about the relation of temperature and length of holding or storage of eggs upon their flavor and functional properties.

In a study[1] conducted at Purdue University, freshly laid, infertile eggs having an initial candled quality of A or better (according to U. S. standards of quality for individual eggs) were held under three temperature conditions: (1) at room temperature (68-80 F.), (2) at refrigerator temperature (about 45 F.), and (3) in commercial cold storage (32 F.). At regular intervals, representative samples of eggs were withdrawn, candled, examined for broken-out quality, tested for functional properties in selected cooked products, and subjected to flavor tests by a trained panel of judges.

The eggs held at room temperature deteriorated in flavor as much in three weeks as those held at refrigerator temperature for 12 weeks, or in cold storage for four months. As might be expected, the longer the eggs were held at any of the designated temperatures, the greater was the decline in flavor scores.

The volumes of angel food cakes made from the egg whites were used as one criterion of the retention of the functional properties of the eggs. There was significant decline in volume of the cakes associated with the temperature and length of storage of the eggs.

Therefore, not only candled quality, but also flavor and certain functional properties of shell eggs are better maintained if the eggs are properly refrigerated throughout the marketing cycle.

For a full report of the study see "Shell Eggs: Quality and Properties as Affected by Temperature and Length of Storage", by R. Jordan, A. T. Barr, and M. L. Wilson. Purdue University Agricultural Experiment Station Bulletin 612 (1954), 59 pp.

[1]The study was supported in part by the U. S. Department of Agriculture through a contract sponsored by the Human Nutrition Research Branch of the Agricultural Research Service.

Fast Tax Write-Offs End

THE issuance of necessity certificates authorizing fast tax amortization for refrigerated warehouses has been ended by the Office of Defense Mobilization. Pending applications will be processed only if they were filed prior to June 11, 1955.

Refrigerated warehousing is one of 25 so called "expansion goals" closed by ODM following a suspension and review of the entire tax amortization program. Only 11 goals have been reopened. The refrigerated warehouse industry constructed or converted 30,646,000 cubic feet of space under the program since it began following the Korean emergency.

New Frozen Food Plant

THE Stouffer Corp., announced it will build a $1,350,000 plant at Cleveland, Ohio for freezing prepared foods, expanding its present facilities by eight times. The firm, which operates 19 restaurants in seven cities, will be able to produce 80,000 packages of frozen foods a day in the new plant.

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SPECIAL
ICE CANS

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ICE CAN GRIDS

Industrial Trucks
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THE OHIO GALVANIZING & MFG. CO.
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HEAD-BACK PRESSURE CALCULATOR

Actual Size 3½ in. square

The Head-Back Pressure Calculator quickly determines the proper head pressure, for various refrigerants when the suction pressure, room temperature or mean water temperature is known.

Such variable conditions as the suction pressure, room temperature, water inlet and outlet temperature, kind of gas used, etc., all enter in determining the proper head pressure.

PRICE $1.00

NICKERSON & COLLINS COMPANY
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New Florida Refrigerated Warehouse Will Hold Million Cases of Citrus

Sketch of new refrigerated warehouse to be built by Central Florida Cold Storage System, Inc.

CENTRAL Florida Cold Storage System, Inc., a new corporation formed by a group of Florida and California business men, has started construction of a refrigerated warehouse to hold a million cases of frozen and chilled citrus and other food products at Plant City, Florida. The plant is to be open for business early in January 1956, according to A. R. Updike, president and Philip B. Stapp, executive vice president.

Callender Engineering Company of Seattle, Wash. designed the plant which is to be fully protected by automatic sprinklers. Refrigeration is to be two stage ammonia through blower units and fin coils. Floor insulation is to be Foamglas, walls and ceiling to be insulated with Fiberglas dry wall construction. The design includes under floor ventilation with warm air from a hot gas cooler and oil trap.

Gilbert and Shields of Tampa hold the general contract. York Corporation has been awarded the contract for the refrigeration equipment. Jos. E. Wendel is in charge of construction for the engineers and owners.

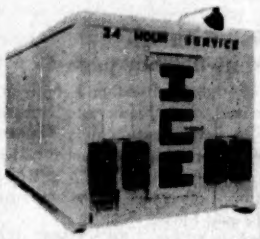
Prestress Concrete Structure on Refrigerated Warehouse

(Continued from page 31)

warehouse construction for all cases. For the particular warehouse under discussion, where concrete construction was desirable and long spans effected operational economies for the life of the building, prestressed cantilever beams offered a most satisfactory solution in all respects.

Other Buildings Planned

Since this project has been under construction, the Preston M. Geren firm made preliminary designs on two other buildings using prestressed beams. It is felt that while prestress is not a "cure-all" for construction problems, it is a building "technique" which is taking its place alongside of reinforced concrete and structural steel, and should be used as the economics of the particular job dictate.



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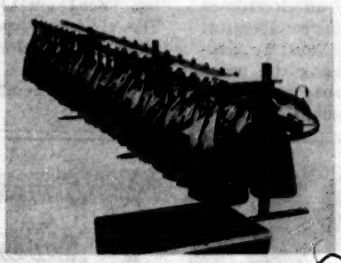

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Mark II. Complete with Blower/Evaporator and Automatic Hot Gas Defrost. With 4 Vending Machines. Tremendous Capacity 10 or 12 lb. bags. Less than $4,000 delivered East Coast.

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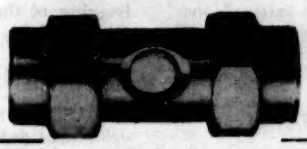

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3000 SERIES (Illustration)

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All feature:

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- Ideal for wide variety of applications.
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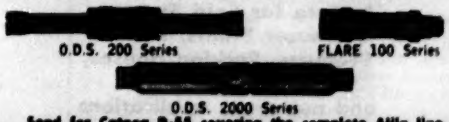
Same design in the 5000 Series with extended tube ends for ¾" thru 1-⅝" copper tube sizes. All Liquid Eye indicators carefully tested to insure trouble-free performance.



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See the complete ALLIN line at Booth 814 A.R.I. Show, Nov. 28 — Dec. 1, Atlantic City.

Question Box

(Continued from page 42)

are in the automobile. This greatly simplifies actual installation in the car.

Controls consist of the following in addition to the standard heater and defroster controls: thermostatic switch for maintaining in-car temperature when cooling; switch for turning the unit on or off; duct valve control. The thermostatic switch is operated by discharge air temperature at the blower outlet.

I have not seen any specific rating figures in terms of tonnage but the following test results on experimental cars are available: During tests at the Proving Ground at Mesa, Arizona, the unit maintained in-car temperatures in the low 80's during 115 F ambient. Temperatures of about 75 F were maintained with 100 F ambient in other road and wind tunnel tests. It is interesting to note that Frigidaire plans to follow standard refrigeration, air conditioning, and heating practices as nearly as possible on future designs. — Harold P. Hayes.

Wants Crusher Identity

QUESTION NO. 1078: Where may we obtain parts for our ice crusher? The only identifying tag on the machine is a little label which says "Champion". C. P., Chgo.

(Editorial Note: Answers to questions of this nature should be addressed to "Readers Service Department" rather than the NAPRE Question Box. The publication often furnishes services to questions of this nature as an adjunct to subscriber and advertiser policies.)

ANSWER: I believe that the name "Champion" on your ice crusher refers to the Champion Line Machinery Company of New Jersey. It is my understanding that they are able to supply parts of their machines as far back as 30 years. JRK.

New Questions

Thermometer Card Dissolves

QUESTION NO. 1079: Recently I decided to clean up a thermometer on a calcium brine pump discharge line. The thermometer was new about a year ago. Around the bottom inside the glass cover there had accumulated a pile of what I thought was slush ice or snow, which covered the lower figures on the thermometer. So I removed the glass and to my surprise I found the "ice" to be dissolved brass or whatever the figure plate was made of.

The mercury bulb is O.K. but that plate carrying the figures sure was dissolved or eaten up, or whatever you may call it. The white deposit was moist and like a thick paste. Instead of covering up the figure plate it was eating it. Now I've been around refrigeration plants quite a while but I never saw anything like this. There appears to be no calcium leaks around the instrument as the thermometer is in a well set into the pipe.—R.G.S., Buffalo, N. Y.

Carbon-Dioxide Immobilizes Hogs For Slaughter

QUESTION NO. 1080: Reports reaching here some time ago indicated that in the U.S.A. some abattoirs are using CO_2 to anesthetize pigs before slaughter, by using dry ice. If you or any members could give me some details of the method employed it may possibly be most useful and helpful.—E.E., Sydney, Australia.

Fresh Water From Salt Water By Refrigeration Processes

QUESTION NO. 1081: I have read a number of articles recently on the subject of making fresh water out of salt water. One article mentioned the possibility of doing this by means of refrigeration. How would such a system work? Would it use the heat pump principle or actually involve the freezing of the water?—J.S., San Luis Obispo, Calif.

Electronic Refrigeration

QUESTION NO. 1082: A new development publicized by an electronics firm is a thermoelectric refrigerator. Can refrigeration be produced by electronic means without using the usual vapor compression or absorption systems?—R.A.W., San Luis Obispo.

Pre-Cast Roof Slabs

QUESTION No. 1083. What experience have NAPRE members had with pre-cast concrete roof slabs or decking? In our cold storage plants, especially freezers, we are having troubles with some of them. Hot air rushes up against the slabs, it condenses, and then freezes. When the door is open again it melts, and when doors are closed again it freezes. This is causing the slabs to go all to pieces. Any suggestions or remedies? P.P., Chicago.

Rapid Ice Freezing

(Continued from page 49)

The normal brine-tank system with all the necessary equipment, weighs about one ton for each ton of ice produced, while a rapid ice plant weighs only about one-fourth ton for each ton of ice produced. Work is in progress at present to reduce the weight of the plant installation still further, and there are prospects that it will soon amount to only about one-tenth of a ton per ton of ice production.

"Rapid-Ice" plants share with plants for small sized ice a common disadvantage. They both need an ice storage. However, the "Rapid-Ice" block is more favorable in the respect that it requires only 1½ cu. meters (44 cu. ft.) storage space, and the blocks also are much easier to stack.

Members at Large

(Continued from page 42)

Harnist has hopes of seeing Fort Worth chapter revived, and Banta and Roberds are active in the formation of a Houston chapter. We can actually quote Galvin as follows: "More Power to NAPRE. I enjoy reading INDUSTRIAL REFRIGERATION. It is full of Good Ideas."

New members accepted by NAPRE since last issued are: Henry C. Hensley, Jr., Fiberglas Construction & Supply Co., Louisville, Ky.; Josef Rosenbach, ice plant operator, Kadima, Israel; and Byramjee Eduljee, refrigeration engineer, Karachi, Pakistan.

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The Ideal Refrigeration Surface for Cold Storages, Freezer Plants, Dairy Products, Packing Houses, Abattoirs, Breweries and numerous applications

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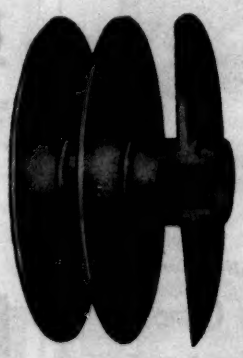

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Cold Storage Tests Show Big Savings for Military

TESTS being conducted at Experiment, Ga., in cold storage of foods may result in large savings for the armed forces, and in better field rations for our fighting men. Cold storage of such perishable foods as meats, dairy products fruits and vegetables is standard procedure. But the experiments are with such articles of diet as cereal bars, chocolate bars, crackers and the like. The purpose is to determine what advantage may be gained from refrigerating these foods over storage storing them in warehouses without any temperature control as at present. Preliminary indications are that the gains may be considerable, said Dr. J. G. Woodroof, head of the Georgia Experiment Station's food technology department.

Field rations stored in warehouses where there are no temperature controls are subjected to temperatures all the way from 20 to 100 F. said Dr. Woodroof. The average life of the rations under these conditions is about three years. Some articles are in poor condition after six months, the experiments show. The Army Quartermaster Corps, requested a two-year test comparing military rations held under cold storage conditions with rations held under conditions simulating warehouses without low temperature facilities. "This two-year test was too brief to reveal very much in regard to rations held in cold storage Dr. Woodroof said. At the end of the two years as far as keeping qualities were concerned the rations were all about as good as the day they were put in cold storage. They did not find out what they wanted to know, which was: Just how long will cold storage prolong the life of the rations?

A five year program has now been started of testing the rations in cold storage. At present, based on a continuation of the initial cold storage tests, indications are that the rations that were useless in from six months to two years in uncontrolled storage will still be usable through four years at least and some of them perhaps five or six years when held in cold storage.

Here are sample results of the test of the rations under cold storage as against those stored at 100 degrees: Cereal bars were of poor quality after five months stored at 100 degrees but were good for 14 months when stored at 70 degrees and 40 months (estimated) at 10 degrees. The corresponding keeping periods for chocolate bars were 5, 12 and 30 months. Crackers stored at 100 degrees were useless at 12 months but good for 28 months at 70 degrees and 68 months at 10 degrees. In general, the edible components remained acceptable about six times longer at 10 than 100 degrees.

Survey of Prepared Frozen Foods

THE first nationwide, detailed survey of the volume and trends of production of prepared frozen foods will be made by the U. S. Department of Agriculture during the next few months. Announcement by Dr. Wayne Bitting of an October 1 starting date was applauded by the Board of Directors of the National Frozen Food Distributors Association at their meeting at the Westchester Country Club at Rye, N. Y. Full association cooperation was promised in securing 100 percent response from the 70 major companies packing prepared foods who are now NFFDA members as well as from the many new packers who as yet have only localized distribution but whose experiments are opening up new customer demands.

Association officials have repeatedly urged upon U.S.D.A. the importance of such a comprehensive, nationwide survey because (1) spot checks show a 300 percent increase in prepared frozen foods in only three years time, making them the "hottest" growth items in the whole grocery field; (2) national production is already variously estimated between $150,000,000 and $250,000,000; (3) there is a serious lack of accurate data as to trends comparable with that on frozen juice concentrates which have proved invaluable to grove owners of Florida and California as well as to packer and distributors throughout the nation.

The forthcoming U.S.D.A. study, to be conducted in Dr. Bitting's section of the Agricultural Marketing Service, will be based on mail questionnaires and personal interviews. In view of widespread interest in the industry in more information about its progress, the AMS researchers hope that the information collected will be a complete report from the industry. The survey is designed to measure current production of prepared foods, to learn about trends in types of foods, and to indicate the relative importance of problems facing the industry.

Prepared frozen foods represent not only one of the fastest-growing but one of the most diversified segments of the frozen food industry. More than 200 different types are being produced, ranging from appetizers to desserts and from individual items, such as beef pot pies, onion rings, clam chowder, nationality dishes, etc., to complete dinners. Additional prepared frozen foods are continually entering the market, and some items are disappearing.

This survey is one of several studies being conducted by AMS in evaluating the present and potential effects of frozen foods upon the marketing of farm products. Collection of this particular data is expected to be complete by the end of 1955.

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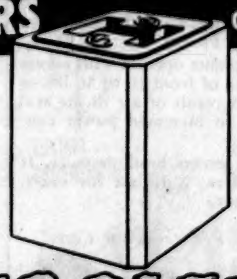

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News of People

Northam Promoted By Miles Laboratories, Inc.

PROMOTION of Paul F. Northam to chief power engineer came about as a result of the retirement of W. M. Kincaide, it was announced in October by F. A. Lobley, vice-president, engineering, Miles Laboratories, Inc., Elkhart, Indiana. Northam, who had been the assistant power engineer, is an active NAPRE member-at-large. He will have operating charge of Miles' 1200 ton NH_3 refrigerating machinery, steam generating plant, 13 air compressors, nine wells and chlorinating equipment, deionizers, and auxiliaries.

Paul F. Northam

At the Midwest NAPRE Educational Conference in April, Mr. Northam was a featured speaker, his topic being "Year Round Air Conditioning for Pharmaceutical Manufacturing". Practical describes the career of this engineer. Starting his career with Miles in 1935, he received his first experience and training from Wm. Kincaide, the engineer whom he succeeds. In World War II he served with the USA Corps of Engineers. The industrial refrigerating plant under his supervision is used principally for process humidity control, one of many elaborate steps at Miles to guarantee quality.

DON S. ANDERSON, director of the Livestock and Dairy Division, U. S. Dept. of Agriculture, has been appointed Chairman of the USDA Cold Storage Industry Advisory Committee. He replaces John H. Dean who was recently named Deputy General Sales Manager of the Commodity Stabilization Service. The committee is tentatively planning its next meeting for San Francisco in November.

Quality in Frozen Apples

STUDIES have been reported on relationship of variety of apple and degree of ripeness to quality of frozen pack, conducted by Caldwell, Culpepper and Demaree of Biological Sciences Branch of the U.S. Dept. of Agriculture, Beltsville, Md. In general it was found that among 16 varieties grown in Eastern states Jonathan, Yellow Newtown, Golden Delicious and York Imperial were best for freezing and made the best pie product. They also found that fruit harvested at the firm-ripe stage should be ripened to a good edible stage before it is frozen. Over-ripeness resulted in a soft texture that calcium chloride treatment did not prevent.

Antitoxidants such as sulfur dioxide, ascorbic acid and citric acid alone or with ascorbic were used in the tests. The SO_2 was most effective in preventing browning, but also, of course, is most likely to affect flavor. When used at low enough concentration in the dipping vat to be safe so far as flavor is concerned, SO_2 did not seem to protect color any better than ascorbic acid (Vit. C). The browning problem is still the ticklish problem.—TRRF Information Bulletin.

AN AIR PURGER for the SMALL REFRIGERATION PLANT

At a price you can afford

REX
MIDGET MODEL
AIR PURGER

Pays for itself
In 6 months!*

*Excess head pressure of 10 lbs. in a 25 ton refrigeration plant increases power costs in 6 months, equal to the cost of a Rex Air Purger.

Many plants operate with excess pressure of from 10 to 50 lbs.—a direct result of air in the system. Just think what this means in increased power consumption.

A Rex Air Purger will eliminate excess head pressure. It is easy to install. No moving parts. Will last for years. There is a model for every size plant.

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DEATHS

Guy J. Henry

THE death of Guy J. Henry, president and founder of Henry Valve Co., Melrose Park, Illinois, occurred in the Oak Park Hospital the afternoon of September 28 at the age of 66 following a short illness. Mr.

Guy J. Henry

Henry, a rugged individualist, had been engaged in the manufacturing business since 1914. His company specializes in making valves and accessories used in air conditioning and refrigeration. He was a former treasurer of the Refrigeration Equipment Manufacturers Association, now Refrigeration and Air Conditioning Institute. Mr. Henry resided in Arlington Heights, Illinois. He was buried from Our Lady of Wayside Church, Arlington Heights, October 1, Interment Queen of Heaven Cemetery. Surviving are his widow, Bessie, two sons, Robert and Thomas, two brothers Otto and Henry and sister Teresa.

C. W. E. JOHNSON, 66, Tacoma, Wash., died September 7 in a Tacoma hospital. He was chief engineer for the Tacoma Ice Company. He lived in Seattle ten years before going to Tacoma in 1929. He was born in St. Paul. Mr. Johnson was a member of the National Association of Practical Refrigerating Engineers and the Order of Eagles.

Herbert M. Baruch

THE death of Herbert M. Baruch, millionaire builder and president of the Federal Ice & Cold Storage Co., Los Angeles, Calif., occurred suddenly October 20 at his mountaintop mansion overlooking the Sunset Strip, Los Angeles. He was 61.

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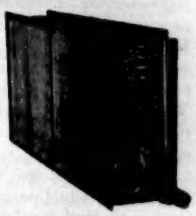

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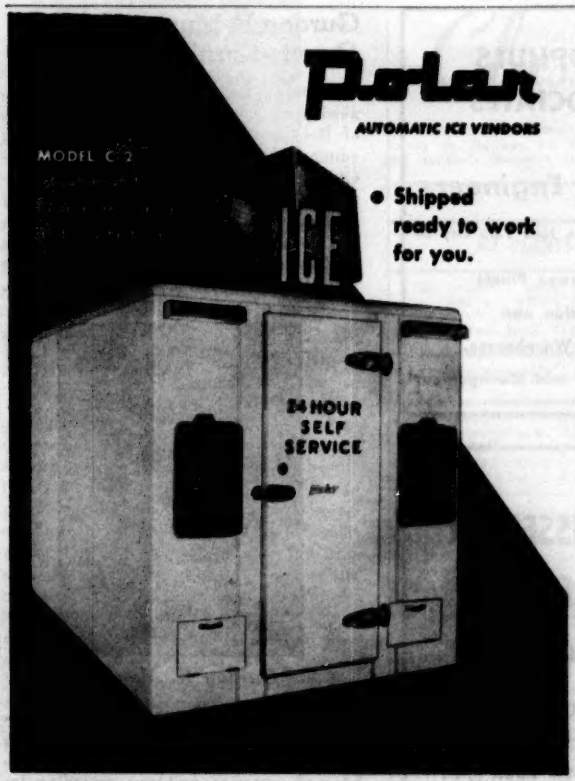

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MANUFACTURERS' NEWS

Johns-Manville Expands Products Division

THE present products division of Johns-Manville will be split into three new operating divisions, the industrial insulations division, the packings and friction materials division and the pipe division. General manager of the new industrial insulations division will be Don L. Hinmon who has also been elected vice-president of Johns-Manville Sales Corporation, it was announced by A. R. Fisher, president of Johns-Manville Corporation. Other division general managers named by Mr. Fisher are Francis J. Waken, packings and friction materials division, and Robert F. Orth, pipe division.

J-M products for which Mr. Hinmon will have production and sales responsibility are thermal insulations, including high temperature insulations, insulating brick and refractories, cold insulations, industrial mineral wools, low pressure insulations; aviation insulations; electrical insulations, including paper and boards, Marinite and Marine Sheathing; and sealing compounds. The J-M Industrial Contract Department has also been assigned to the Industrial Insulations Division.

The expansion in organization, which becomes completely effective January 1, 1956, continues the decentralization of operations started in 1946 and backed by a continuing plant and mine expansion program in which about $20,000,000 has been invested each year since the end of World War II, according to L. M. Cassidy, Chairman of the Board. "It will enable Johns-Manville to boost sales, meet competition, provide more attractive investment possibilities and greater job stability for employees", Mr. Cassidy said.

Mr. Hinmon's staff for the new industrial insulations division will include Thomas H. Eaton, production manager, who has been elected vice-president of Johns-Manville Products Corporation, and J. B. Jobe, merchandise manager, and Edward D. Flavin, general sales manager, who have been elected vice-presidents of Johns-Manville Sales Corporation.

When construction of two new plants, begun this year, is completed in 1956, Johns-Manville will operate 23 plants in the United States and Canada, two asbestos mines in Canada, diatomite mine in California, large Research and Engineering Centers in New Jersey, as well as extensive mining, manufacturing and sales activities abroad.

Cosby Joins Presstite As Executive Assistant

CHARLES E. COSBY has joined the staff of the Presstite Engineering Company of St. Louis, Mo., as executive assistant to the vice-president in charge of sales. Mr. Cosby, who prior to his association with Presstite, served as divisional sales manager of Mallinckrodt Chemical Works in St. Louis, has broad marketing and sales experience. He has a M.B.A. degree from Harvard Business School in sales management and industrial management. Initially, he is taking over functions of marketing, merchandising, market analysis, market research, sales training and sales forecasting.

Charles E. Cosby

Gurdon R. Munger Joins Owens-Corning Fiberglas

GURDON R. MUNGER, former technical secretary of The American Society of Refrigerating Engineers and managing editor of its data books, has joined Owens-Corning Fiberglas Corporation as an assistant to Tyler S. Rogers, technical consultant. In announcing his employment, Mr. Rogers also said that Owens-Corning is establishing a new service unit to assist customers in the use of Fiberglas products.

Gurdon R. Munger

Mr. Munger, an expert in air conditioning, refrigeration and heat transfer, brings to Owens-Corning a thorough knowledge of customer problems regarding insulation matters and has the ability to work out their economic solutions, Mr.

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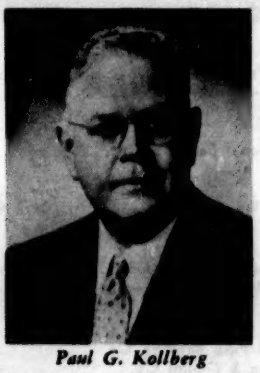
Rogers said. He also said that Mr. Munger's first major assignment will be the comfort engineering of houses to be submitted in a two-year test problem to determine whether the average home in the United States can be heated and cooled for an average of $10 per month.

In this work Mr. Munger will analyze houses submitted for tests and predict the heating and cooling costs based on engineering analysis of each dwelling and its location. He also will check the actual performance of the homes against his earlier predictions.

Mr. Munger, 31, is a native of West Hartford, Conn. He received a bachelor of science degree in engineering from the Air Conditioning and Refrigeration Engineering Department of California State Polytechnic College, San Luis Obispo, Calif., in 1951.

Henry Valve Appoints Field Engineer

THE appointment of Paul G. Kollberg as field engineer has been announced by The Henry Valve Co., Melrose Park, Ill. A graduate of Cornell University, Kollberg served as a Lieutenant Commander in the United States Naval Reserve during World War II, and was recently associated with the Engine Division of the National Supply Company as branch manager in the Chicago area. His position will involve primarily an analysis of new industrial developments and application of company products to those fields.



Paul G. Kollberg

Armstrong Appointment

M. F. KOTTMEIER has been appointed manager of the Armstrong Cork Company's insulation division district office at Chicago to fill the vacancy created by the illness of C. W. Robinson who for many years has been manager of that office, according to A. E. Pearce, general sales manager of the company's insulation division. Mr. Kottmeier joined the Armstrong organization in 1930. After sales training, he was assigned to the Chicago district office where he has served since that time as a sales specialist on the company's low temperature and equipment insulation products.

William J. Appel of Armstrong's Pittsburgh Office has been appointed district manager at Pittsburgh to fill the vacancy created by the recent assignment of F. S. Donnelly, formerly Pittsburgh manager, to manager of insulation sales.

International Salt Names Merchandise Manager

CLARENCE E. SORG, JR. has been appointed merchandising manager for all Sterling Salt products, it has been announced by J. L. Ryon, vice-president of the International Salt Company. The appointment, according to Mr. Ryon, results from the expansion of the advertising and merchandising department. The Company plans a broadening of its market.

Worthington Pension Plan

AT A recent special meeting stockholders of Worthington Corp., Harrison, N. J., approved revision of the company's non-contributory pension plan for hourly and certain salaried employes. The plan now establishes a maximum of $140 a month pension, including social security pegged at $98.50 a month. Previously the maximum pension was $100 a month, including social security.

CATALOGS AND BULLETINS

Caterpillar Booklets

TWO new engines, the D342 and D339, has been announced by Caterpillar Tractor Co. through the recent publication of a broadside mailing piece. Included in the two-color publication is a full explanation of the machining and research going into the production of these latest additions to the company's line. Pictures illustrate clearly the "long life" features built into the two modern heavy duty engines by Caterpillar engineers. The low maintenance and operating cost of the machines is detailed by graphic explanations of the money saving fuel system, and factory produced parts. Special production methods used in the machining of crankshafts, camshafts and heads are shown to lengthen engine life and decrease down time.

Public services, cities and industry cannot afford the loss and danger following electric power failure caused by storms, mechanical breakdown, or enemy actions. "When Power Fails," a publication recently released by Caterpillar Tractor Co., tells how to forestall disaster by installing standby power units now. This eight-page booklet is illustrated with photographs of a few of the many and diverse installations using Cat Diesel Electric Sets.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words, $2.00 per line for bold face headings: $15.00 per inch for nine listings.

ICE PLANTS—for sale

FOR SALE — Meat processing, cold storage, locker, and ice plant; large building with ten lots. Located in Goodland, Kansas. Will sell on terms. Contact Jesse Topliff, Goodland, Kansas.

USED EQUIPMENT—wanted & for sale

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-5299.

WANTED — 200 to 300 used ice cans, 11" x 22" x 60" I.D. Must be in good condition. National Ice & Fuel Corp., 38 S. Dearborn St., Chicago 3, Ill.

FOR SALE — 1344 feet of FINNED PIPE — 12' lengths. Made from 2" pipe — 7" fins — 1½" apart. All heavily galvanized. NEW at half price. Also 150 steel hand trucks — roller bearing wheels, $6.00 each new. West Side Cold Storage Co. 7 Harrison St., New York 13, N.Y.

FOR SALE — 1 — 8x8 Bedell ammonia compressor, new, $2200.00; 1 — 6½x6½ Bedell ammonia compressor, new, $1,800.00; 1 — 5x5 Bedell ammonia compressor, new, $800.00; 1 — 6½x6½ York, used, with motor $650.00; 2 — 5x5 Arctics, rebored and rebuilt like new, $450.00 each; 1 — No. 999 Van Norman reboring machine $1,000.00; 1 — medium and large Sawyer crankshaft returning machine and all tools, $500.00. Bedell Ice Machine Co. Harley Benedict, 506 Snug Harbor Road, Newport Beach, Calif.

FOR SALE — Ammonia compressors 4x4 to 10x10, 9x9 with Diesel engine, 50 h.p. 2-bearing synchronous motor with exciter and starter, 75 ton Niagara condenser; York 30 ton trunk coil complete; cans, cranes, agitators, blowers. Parke Pettegrew, 370 West Broad St., Columbus 8, Ohio.

FOR SALE
Ammonia compressors, 4x4 to 10x10.
Two 6 cylinder Frick V-type compressors, with brine coolers and condensers.
12½ & 20 h.p. motor generator sets.
20 & 30 h.p. Gould pumps.
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"A" & Venango Sts. Philadelphia 34, Pa.
GArfield 6-2221

FOR SALE — Two 8x8 Frick Vee belt drive with 30 h.p., 3 ph., 220 volt 60 cy. motors. Two 200 g.p.m. pumps with 10 & 7½ h.p. motors; one 75 g.p.m., 5 h.p. One 20"x18' Vogt S & T brine cooler with float valve gage glass etc. One 40 ton Niagara evap. condenser. One 20"x10' ammonia receiver with gage glass safety and shut off valves. Miscellaneous ammonia valves and fittings. The above equipment can be seen in operation before dismantling. Richardson Engineering Co., 762 W. Laclede Ave., Youngstown, Ohio.

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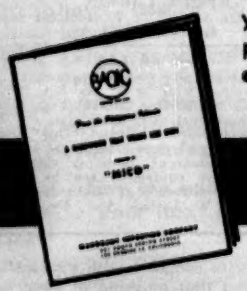

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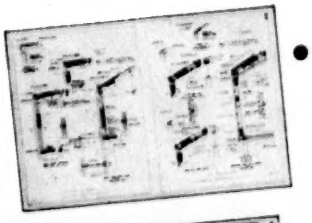
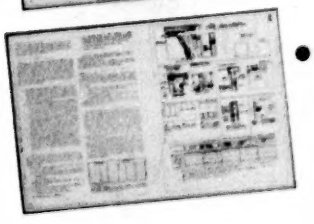


- Comprehensive construction detail drawings

- Technical data assembled for quick reference... helpful installation illustrations



- Time-saving charts, design information, construction tips

Easy-to-follow drawings, charts and information in this new manual have been compiled by refrigeration engineers with years of practical field experience. In quick reference form, it presents basic data to aid both designer and builder. It covers advanced design and construction methods, vapor proofing, overall U values of various types and thicknesses of insulated wall cavities, and other data to relieve the designer of need for complicated computations. Send today for this valuable new aid to insulation planning.

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